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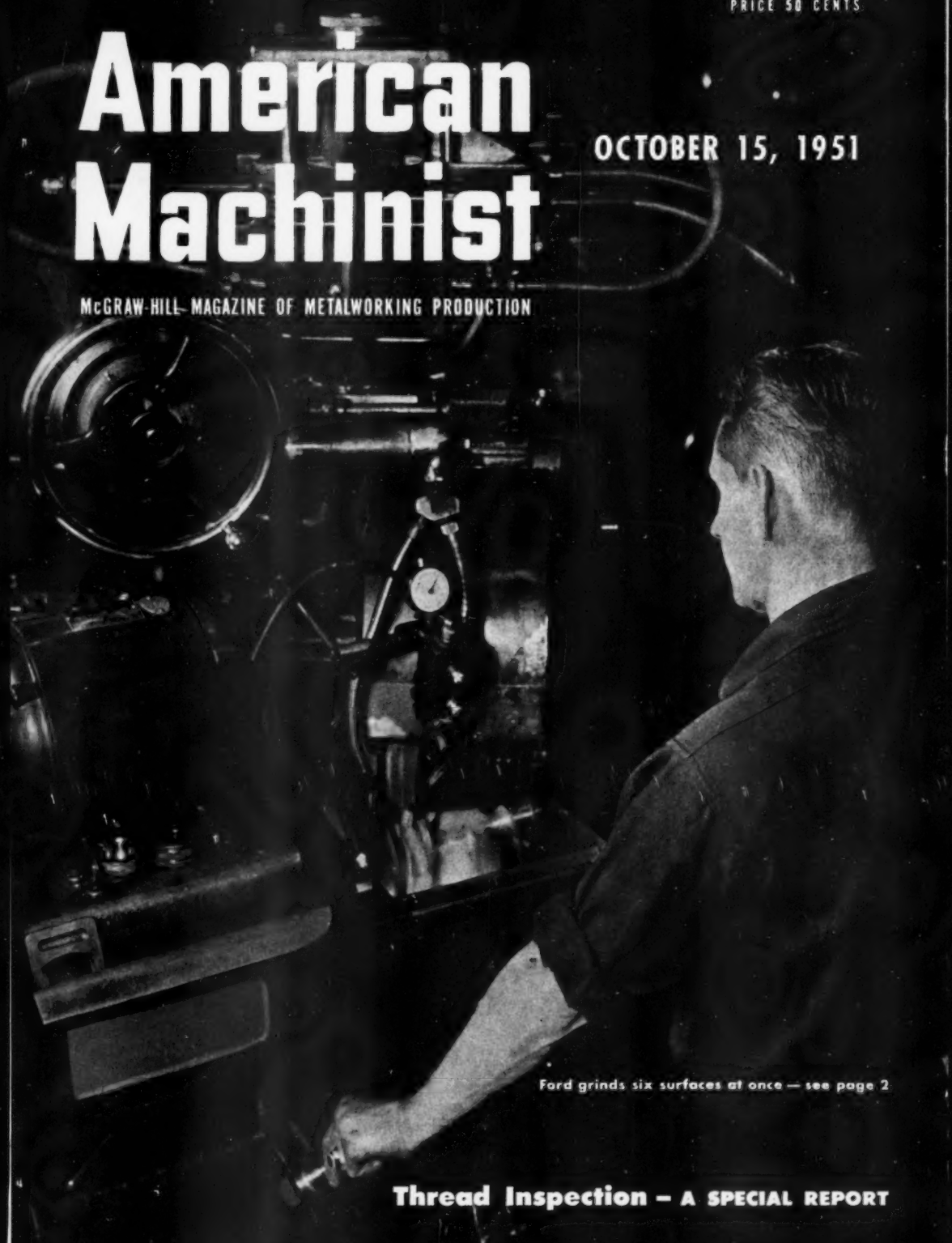
American Machinist

OCTOBER 15, 1951

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Ford grinds six surfaces at once — see page 2

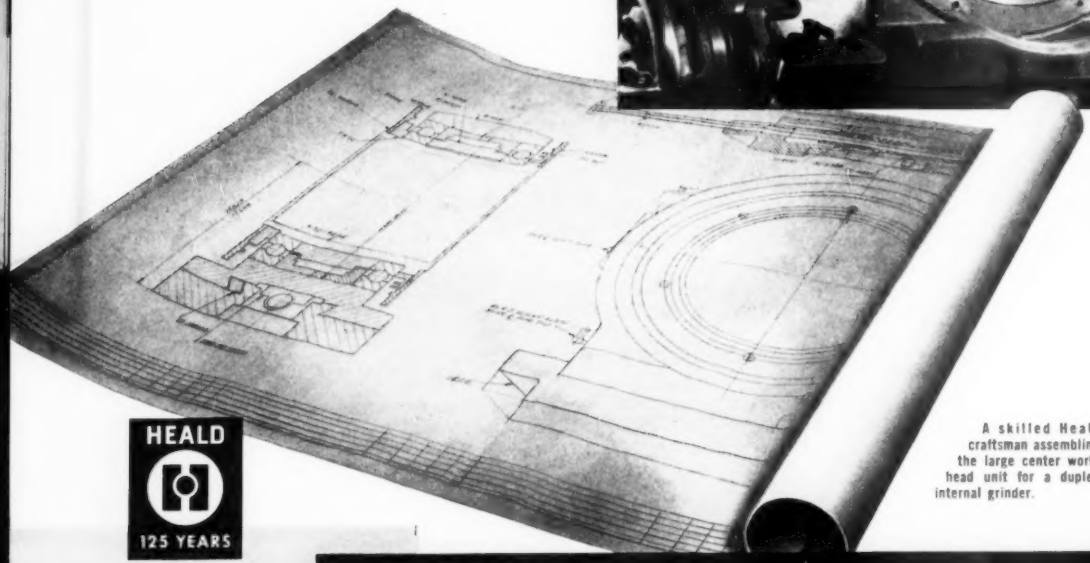
Thread Inspection — A SPECIAL REPORT

there's extra precision in the ASSEMBLY of every Heald machine

for Heald's skilled craftsmen know that this means more and better production for YOU!

There's one thing that goes into the making of a Heald machine that can not be measured — even with the most precise testing instruments. That's the skill and experience of the men who build it.

Take the complex and intricate assembly operations, for example. They require the steady hand and trained eye of a master craftsman — the manual skill that comes only with years of experience. And these Heald craftsmen know the importance of doing every job *well*. There can be no compromise with quality — no short-cut to perfection. For Heald puts this extra care into every Bore-Matic and Grinding Machine to make sure that it will give extra precision and higher sustained production for YOU.



A skilled Heald craftsman assembling the large center work-head unit for a duplex internal grinder.

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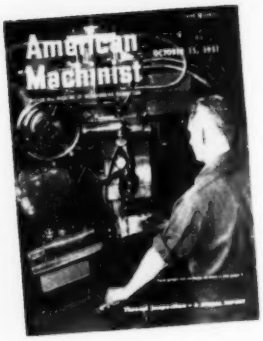


Chips and QUIPS

Multiple Grinding . . . Our cover Kodachrome pictures a Landis plain grinder finishing three diameters, two tangent radii, and one face in a single operation with the wheel-base swiveled to 30°. Setup is at Ford's Mound Road Plant in Detroit, where they report each machine replaces four centerless grinders for the same operations.

Inspection . . . Bill Stocker's fourth big Special Report on threading—this one on thread inspection—covers a specialized subject with wide application; and one that is abnormally important for being only part of a process. Checking threads takes more time, more education, and more effort than most other kinds of inspection jobs, and is often the critical production phase where many a good shop loses ground. After you know how to make threads, you still have to pass the inspector; and his job is demonstrated in the 16-page Special Report in this issue. Our point? If you know what Inspection is looking for in a thread, you're forearmed by knowing what to watch out for in production. Too, here's plenty of material as a basis for setting up your own thread-inspection department.

Top Training . . . Competent, experienced workers may be tough to find, but they're not nearly as hard to come by in most industries as are good foremen and supervisors on a higher level. Making sure you have adequate plans for supervisory personnel for the future is just good sense, but carrying out the idea is no snap. A 4-page story from Lockheed Aircraft tells how *they* do it, and roughly outlines their most effective training programs.

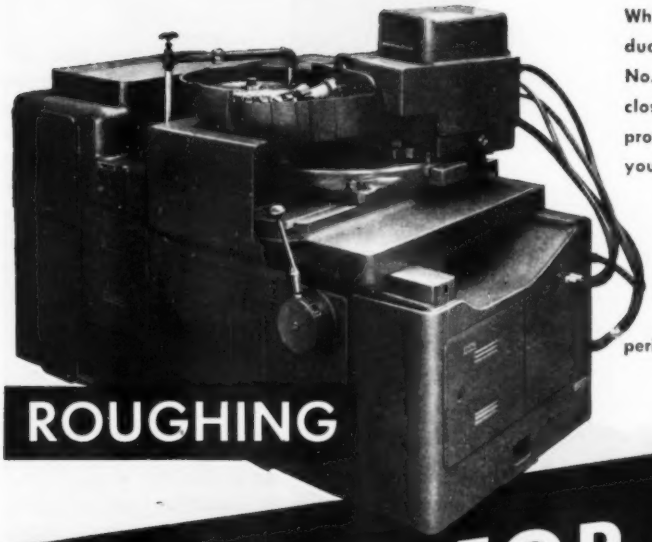
Machinability . . . Professors Shaw and Smith of MIT continue their series on machinability with metallurgical considerations, telling why cemented carbides, cast alloys, and diamonds are able to cut at high speed. The article discusses the physical properties of carbides particularly, and lays the groundwork for an appreciation of the factors causing tool wear.

Library . . . From Pratt & Whitney Aircraft comes a yarn about a library—but not the kind you'd expect. P & W needs storage space for the many gages and kinds of sheet stock on hand at all times. Instead of casting around for more space and getting involved in extra transportation troubles, the engineers modernized their storage area to multiply its capacity. Now, "books" made up of steel frames and plywood panels can be hoisted out of the "stacks," laid down on the floor, opened, and individual or multiple sheets can be removed for processing.

Controlling Forgings . . . In a shop where five million forgings are produced a month, quality control can do a lot toward reducing forging costs, lengthening die life, and improving the product. From International Harvester comes an article, with illustrations of control charts, on what goes into a good system . . . On the strict tooling side, we have a spread of the ever-popular Shop Shots, a page on segmental dies that split and flare radio tubing from Motorola, and a page from Minneapolis-Honeywell that shows how to mount drillpresses horizontally to cut both ends of valve bodies.

Coming . . . Our October 29 issue will feature a Special Report on machining copper-base alloys. Now that copper's in short supply, it is more important that even to be efficient and economical in making brass and copper-alloy products; and one of the ways to do that is to machine the right way. The report is a handbook on basic techniques and procedures. There will be the fourth Shaw-Smith article in the series, a 5-pager on tooling that produces an Army range finder at the Frankford arsenal, a shortie on an unusual Canadian materials-handling problem, and—for shops that are shy on personnel—a story on how to work with employment agencies to get the kind of workers, and the number, that you want.

QUALITY MAN . . . Chief Inspector R. D. Long of International Harvester's Fort Wayne works has been with IH for 20 years—a good background for his authorship of "Quality Control Charts Boost Forge-Shop Performance" in this issue. Starting as an engineer, he transferred into manufacturing engineering after four years, then took Executive Student Training as preparation for managerial jobs. Appointed Chief Inspector in 1945, he has since been active in the development and promotion of statistical quality control.



When your straight bevel gear production requires more equipment, the No. 7 Revex Rougher gives you rapid, close roughing of tooth taper and profile shape more rapidly . . . frees your No. 14 Straight Bevel Generator from roughing so that full production time can be used for finishing . . . leaves little metal for finishing tools to remove . . . tools last longer, thus providing a superior quality in the completed gear.

ROUGHING

PAIRED FOR PRODUCTION

The Gleason No. 14 Straight Bevel Generator is completely universal for roughing or finishing. When production requirements increase, it is also the ideal machine for finishing only. Production schedules for producing quality Coniflex gears can easily be maintained when these two machines are paired for high production.

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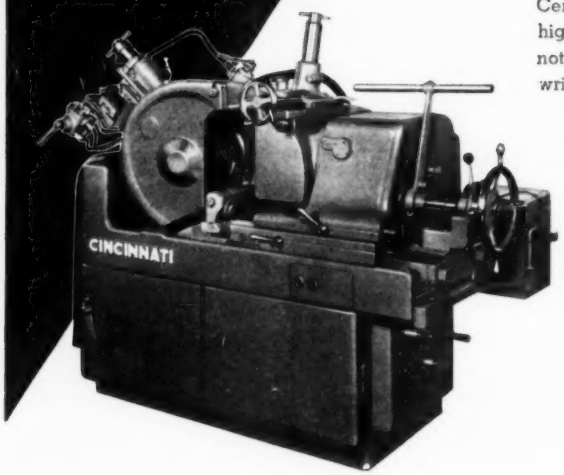
HELPFUL HINTS FOR LONG SERVICE

FROM YOUR

CINCINNATI FILMATIC CENTERLESS GRINDING MACHINES



The big problem today is to keep production rolling. It's a lot easier to do if your shop is equipped with dependable machines which require but little attention. Nearly everyone knows about the dependability of FILMATIC spindle bearing mountings for CINCINNATI Centerless Grinders. They run for years without ever interrupting production. The following suggestions will help you make the overall machine performance as dependable as FILMATIC bearings:

LUBRICATION of your CINCINNATI FILMATIC Centerless Grinder is simple and easy; do not neglect it. For infeed work, lubrication of the slides is very important. On the newest machines, this is automatic. For older machines, lubricate twice a day with heavy EP oil. As a reminder, make a chart similar to the one in the instruction book, and attach it to your machine.

OIL FILTER for the hydraulic and grinding wheel spindle lubricating system should be replaced about once a year. This is easy to do, and filters are inexpensive.

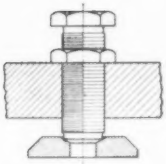
LEVELING is required only when installing or moving the machine. Once established, the heavy box section of the bed retains alignment. However, foundations may settle, so a periodic check is advisable.

In short, about the only things required to maintain the overall dependability of CINCINNATI FILMATIC Centerless Grinders are regular lubrication with high-grade oil and changing the filter. ¶If you are not familiar with these fine precision grinders, write for literature.

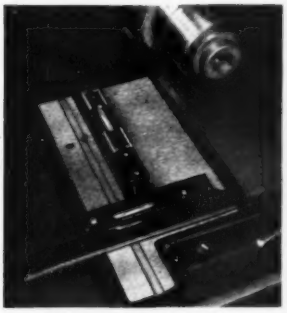
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI FILMATIC Centerless Grinding Machine. Complete specifications are contained in catalog No. G-574.

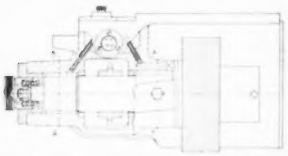
CINCIN



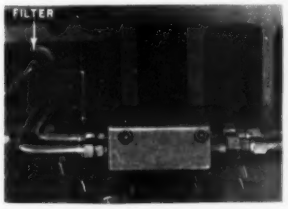
Built-in leveling jacks provide a way to accurately level the machine.



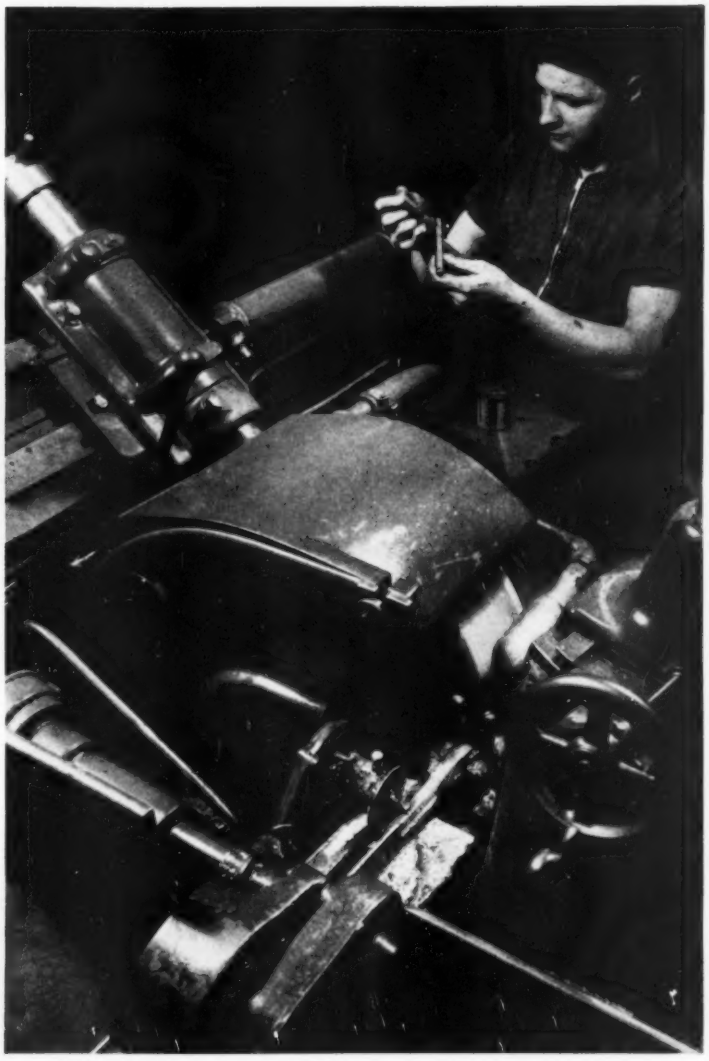
The machine can be accurately leveled with the aid of sensitive spirit levels placed on the bearing surface for the work rest.



Regulating wheel spindle bearing lubricating system. Oil level may be easily maintained between the high and low limits.

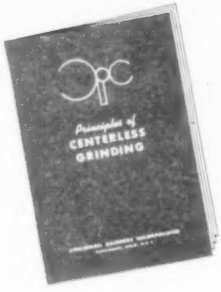


Location of filter for hydraulic system and grinding wheel spindle bearing oil. Filter can readily be replaced.



A high production, thru-feed grinding setup on a CINCINNATI FILMATIC No. 2 Centerless equipped with hopper feed. Given periodic attention, this machine will produce continuously for many years.

SEND FOR FREE BOOKLET No. G-503-2.

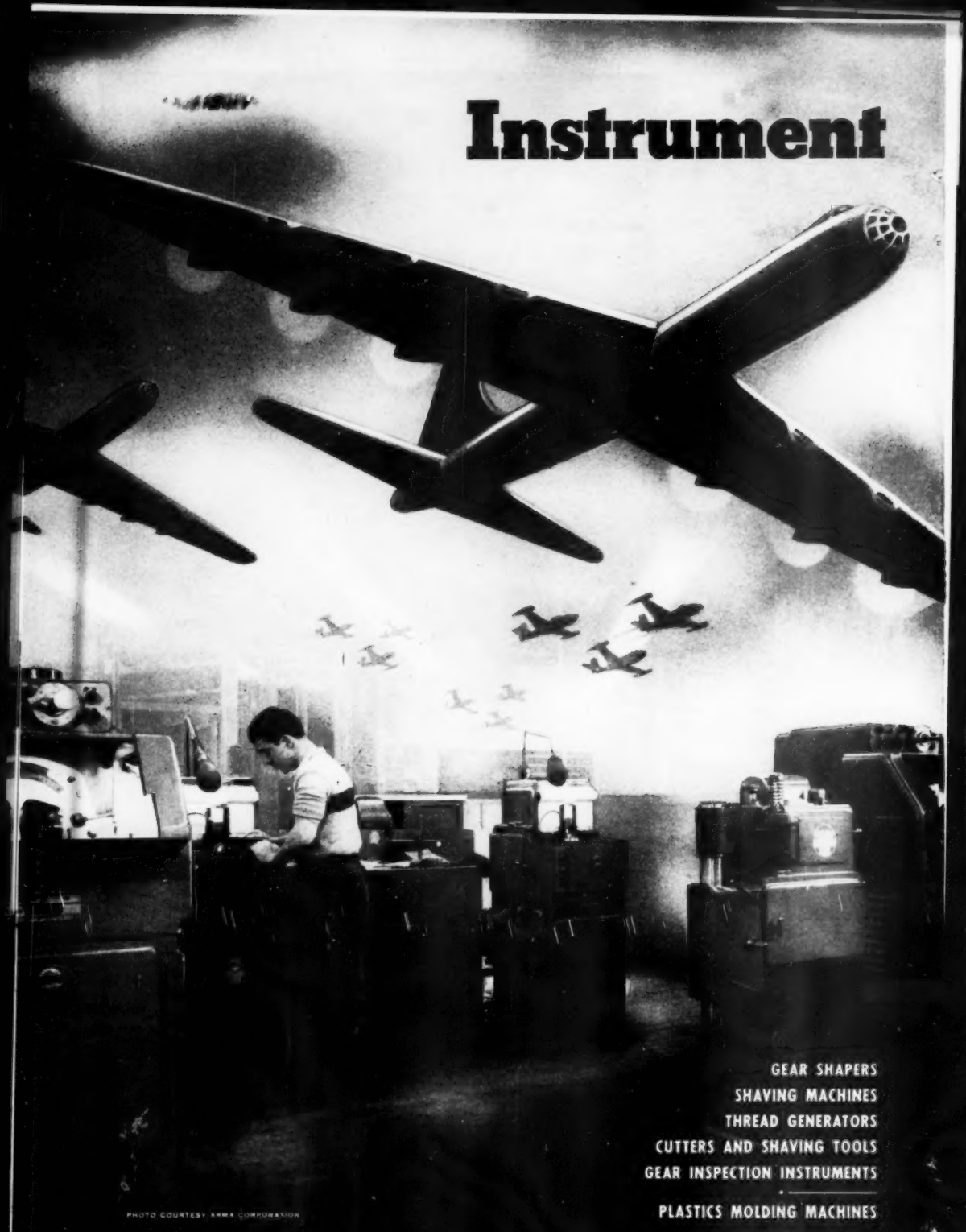


This booklet explains the centerless principle; tells how to set up and estimate production for CINCINNATI FILMATIC Nos. 2 and 3 Centerless Grinders.

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Instrument



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

PHOTO COURTESY ARMA CORPORATION

Gear Making relies on the *Fellows* Method

ARMA INSTRUMENT

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

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Holding production to exceptionally close tolerances is a marvelous team accomplishment

The details are 'top secret' Each maker here represented is a specialist in his own right. The technical supremacy of our civil *and* military aviation, our guided missile and other developments, is directly augmented by the inventiveness of all our instrument makers and the excellence of their manufacturing techniques.

Where gears are concerned, the skill of shop experts combined with Fellows precision equipment achieves exceptional accuracy on a commercial basis. For fine-pitch gears, Fellows 3-Inch Fine-Pitch Gear Shapers, Shaving Machines, Red Liners, and other inspection equipment, present an unbeatable combination.

Fellows Experts are constantly available to discuss costs and the Fellows Method of fine-pitch gear production. Catalog literature is yours for the asking.

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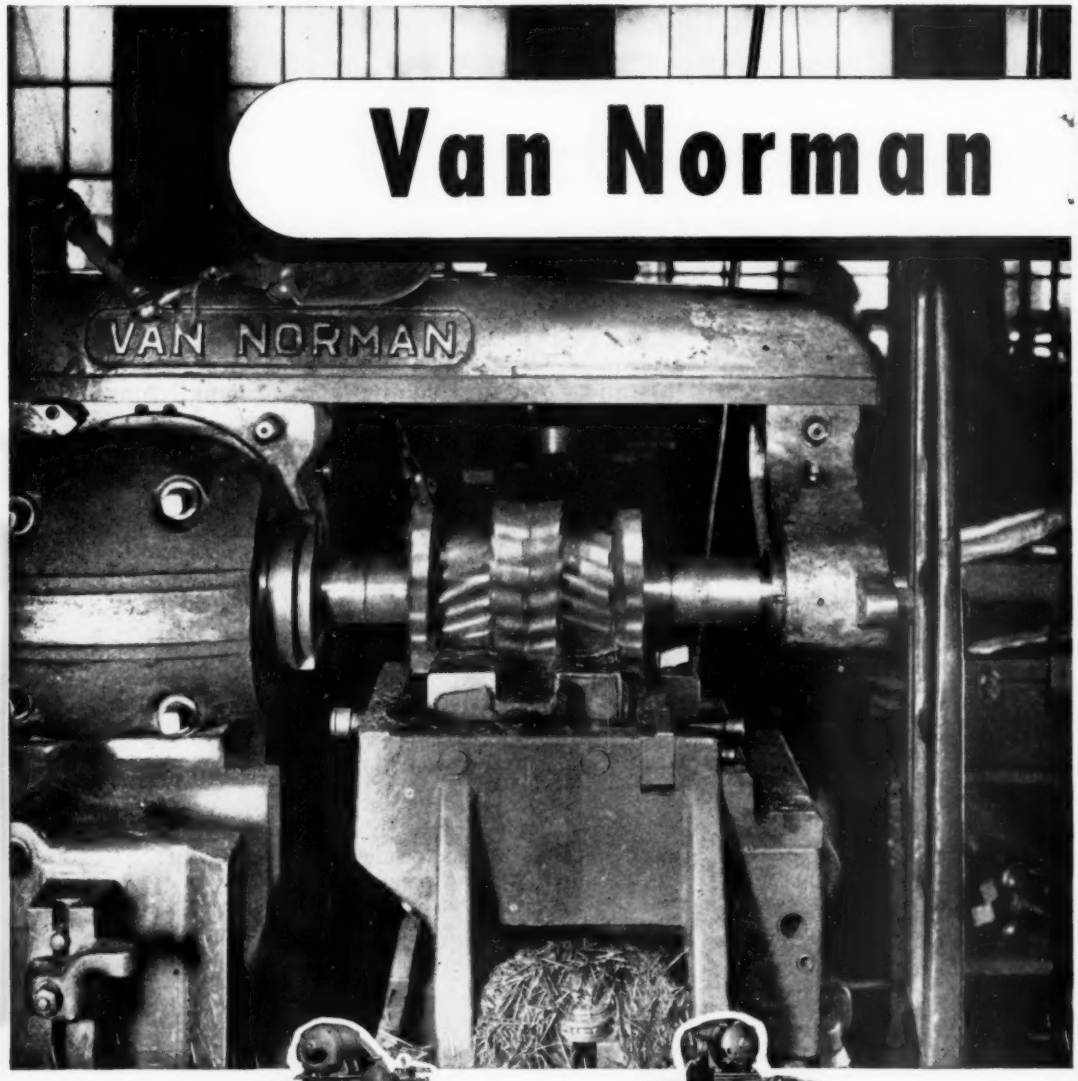
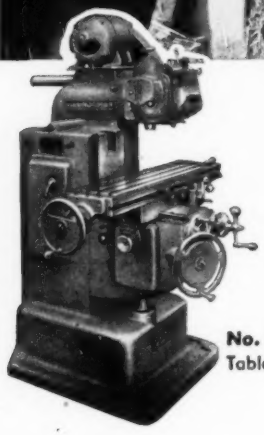
Van Norman





No. 16
Table: 37" x 9½"

No. 22L
Table: 45" x 10"

Ram Type Millers

Increase Productivity Wherever They Are Used

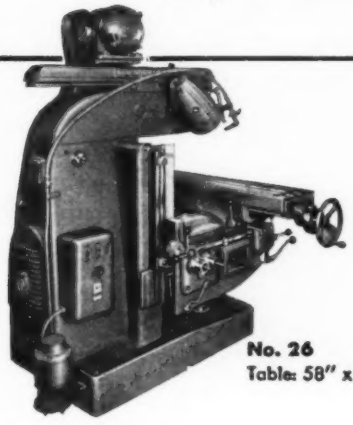
Whether it be in the toolroom, production department, machine shop or laboratory, Van Norman Ram Type Millers increase milling output and cut cost.

Here's how these versatile milling machines enable you to perform horizontal, vertical and angular milling on *one* machine. Simply position the adjustable cutterhead in the required position, lock and you are ready to proceed with the work. They minimize down time for work reset-ups because most jobs can be carried through to completion in the original set-up. In addition, the adjustable cutterhead in combination with the moveable ram and saddle cross feed increases the work range of these millers. Ease of operation is assured with the conveniently grouped operating controls, large easy-to-read dials and quick change speed and feed selectors.

Van Norman Ram Type Millers are available in a wide range of sizes with plain and universal saddles to meet practically all milling requirements. Write for information.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"



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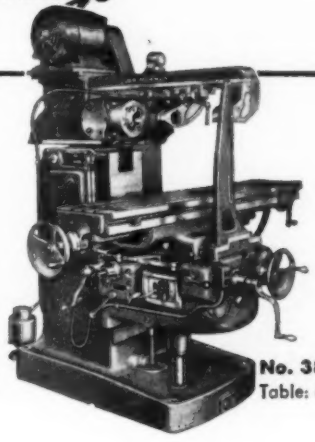


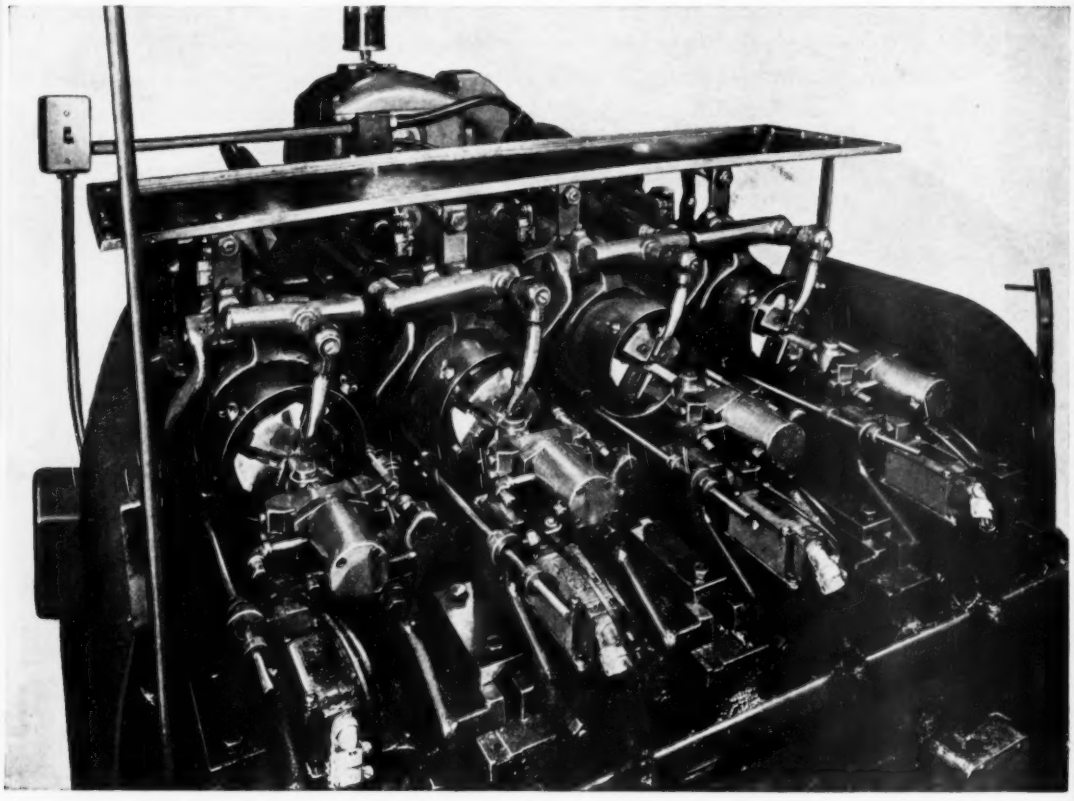
No. 38
Table: 64" x 14"

LABOR COST
. . . *with* LANDIS *Semi-*

Illustrated in the plant of a large manufacturer of automobile parts is a LANDIS 4 Spindle Semi-Automatic Machine mass-producing 7/16" 18-P threads 2¼" in length on tie rod sockets. The threads are cut to a Class 3 fit at the rate of 520 pieces per hour. This operation was formerly performed on a double-spindle machine . . . at twice the cost in labor.

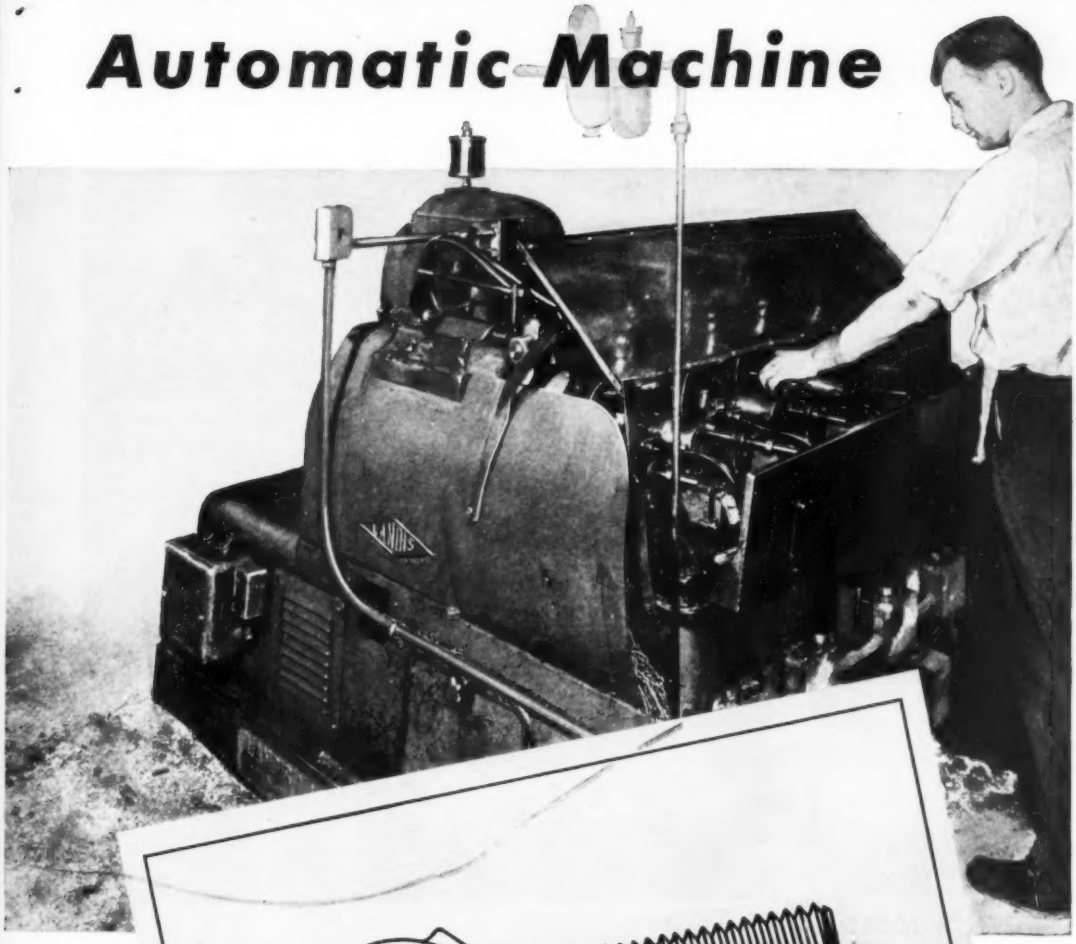
This machine, whose diametrical capacity ranges from ¼" to 1", is designed for the mass-production of precision threads. During the operation illustrated here, manual labor consists merely of placing the blanks on work-holding pins and removing them when threaded. The machine is so compactly built that one operator can easily reach any one of the four work-loading stations from a fixed central position—a feature which enables one man to do the work of two with minimum operating fatigue.

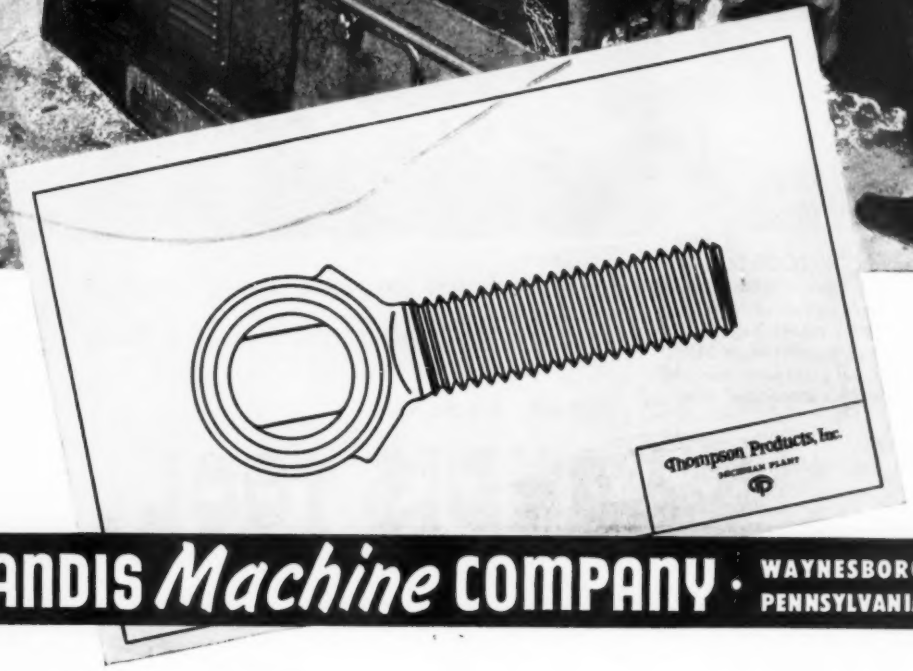
Through the combined output of four die heads, high production is obtained at comparatively low spindle speeds. This feature not only results in finer thread finish, but also greatly extends chaser life, thus effecting a sharp reduction in tool cost. Other advantages inherent in the LANDIS 4 Spindle Semi-Automatic Machine include: quick set-up; thread concentricity; elimination of side-shave; and adaptability to a wide range of threading operations. For complete information, write for Bulletin E-88.



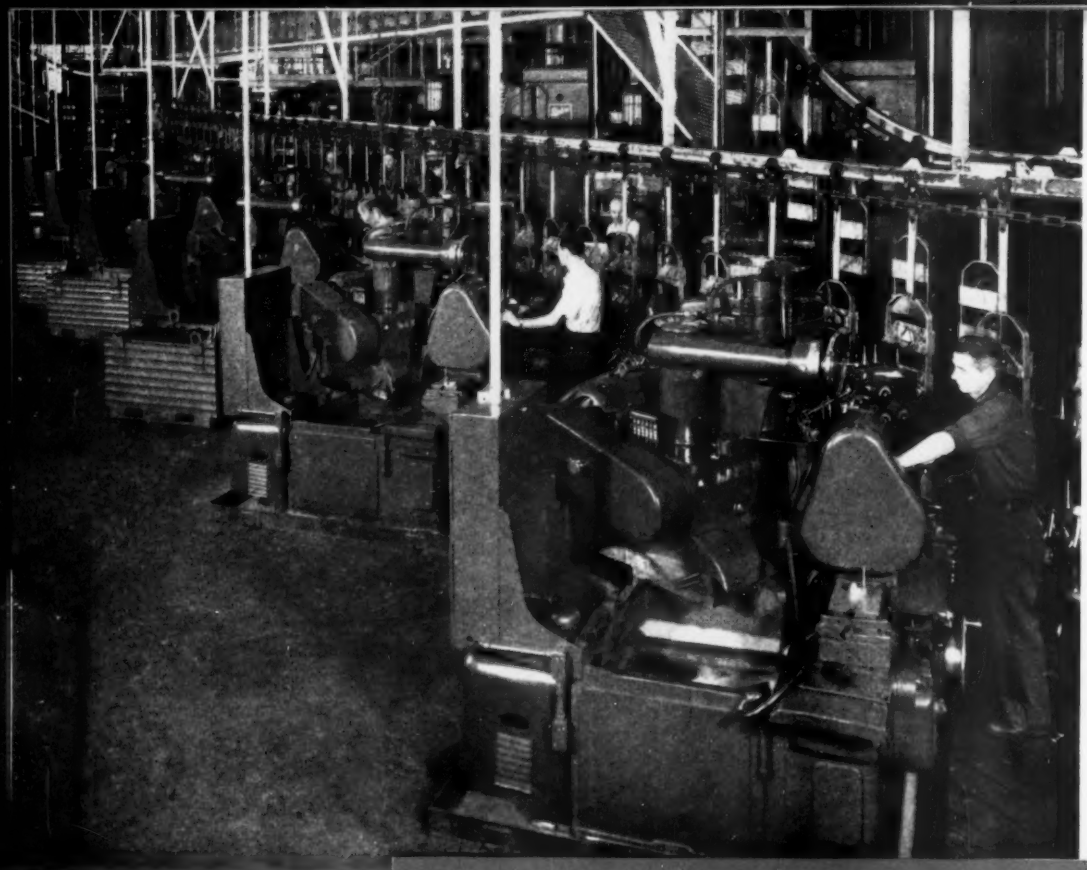
SLASHED 50%

Automatic Machine





LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA



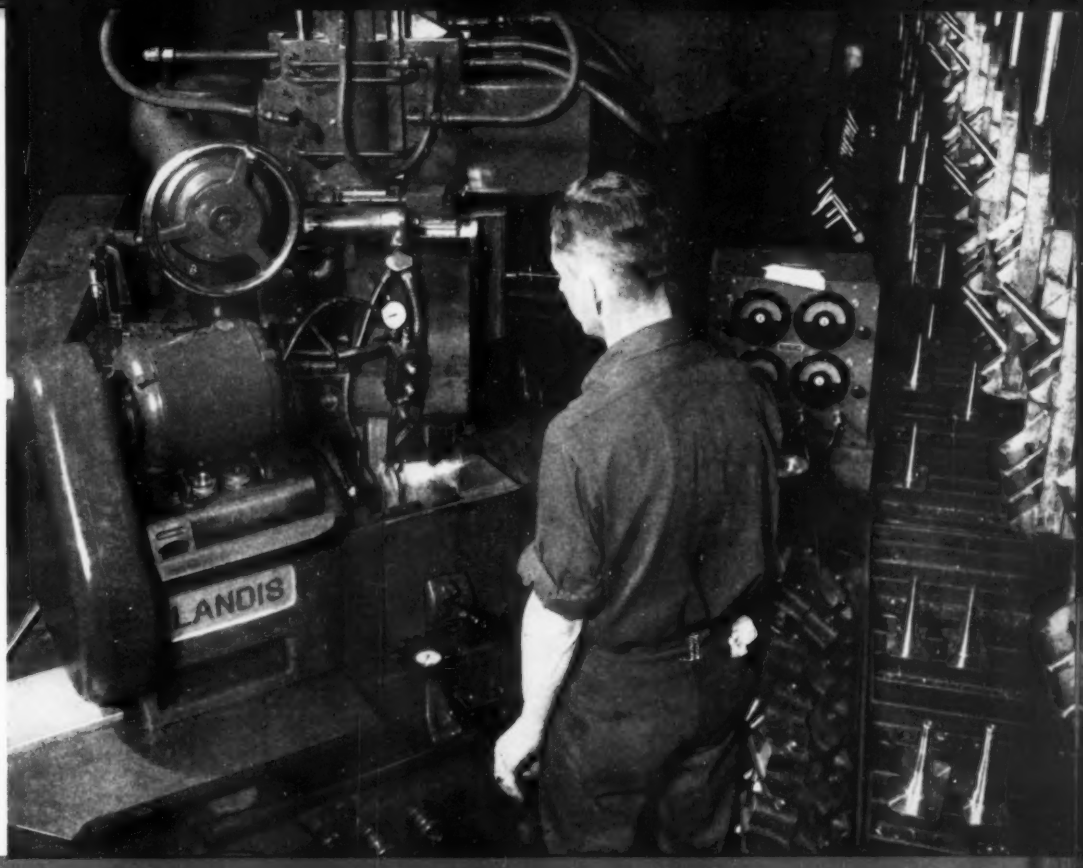
Ford uses LANDIS

Seven LANDIS TOOL 14" x 18" Type CH Plain Grinders with new overhead profile wheel dresser and wheel base set at 30°. These machines in FORD Mound Road Plant have released manpower for more vital jobs.

141

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U. S. A.



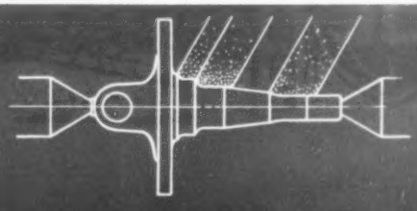
method to boost machine output 4 times

Grinding operations combined by grinding 3 diameters and 3 blending radii in one operation . . .

- *less machine investment*
- *production costs reduced*

WORK DATA

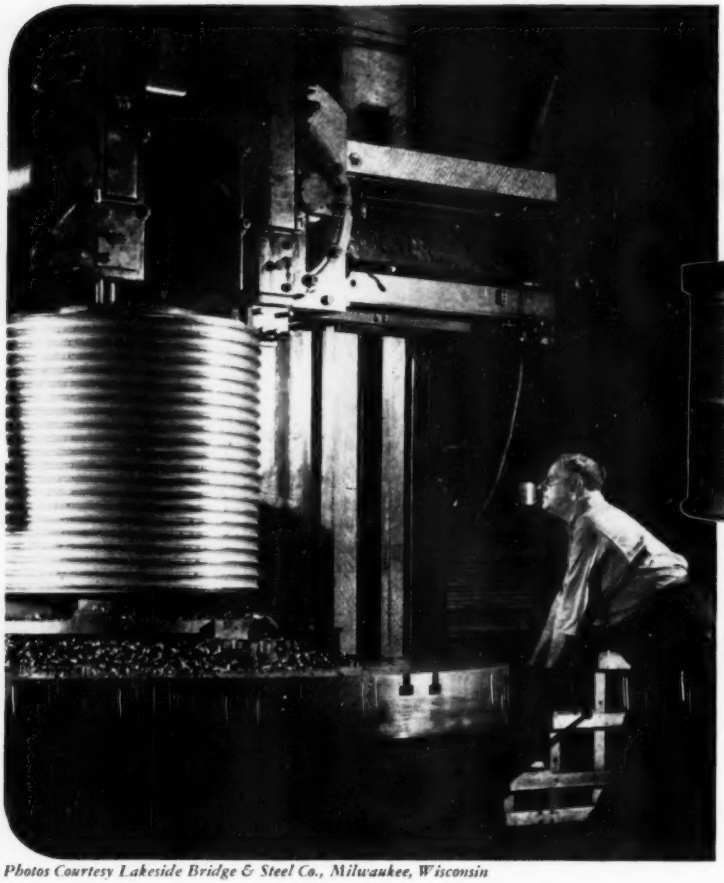
Name of Part—Front Wheel Spindle
Pieces per Hour—90
Machine—Type CH Plain Grinder with Angle Wheel Base
Stock Removal—.015" on diameter
.009" on faces
Limits—.0005" on diameter
.010" on radius
Material—Steel Forging



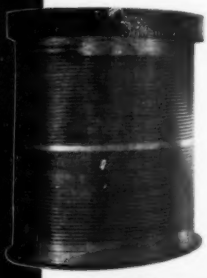
where types of work change and operations vary...

GIDDINGS & LEWIS

HYPRO



Typical hoist cable drum being scored on a Cincinnati Hypro Vertical Boring and Turning Mill.

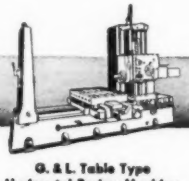


Seven-foot cable drum showing right and left hand drum scoring.

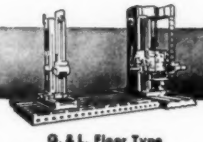
Photos Courtesy Lakeside Bridge & Steel Co., Milwaukee, Wisconsin

GIDDINGS & LEWIS
FOND DU LAC

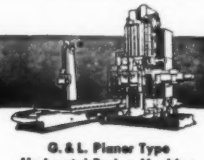
G&L HYPRO



G. & L. Table Type Horizontal Boring Machine



G. & L. Floor Type Horizontal Boring Machine



G. & L. Planer Type Horizontal Boring Machine

Vertical Boring and Turning Mills
offer unusual machining versatility and range

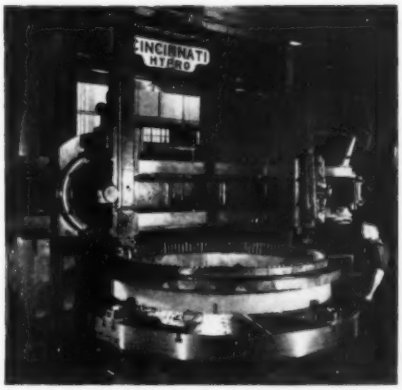
Ample Swing Between Housings and Clearance Under Rail Permits Vertical Mounting of Hoist Cable Drums for Boring, Turning and Drum Scoring

Boring, turning and drum scoring operations on fabricated or cast hoist cable drums are easily handled with a Cincinnati Hypro vertical mill. Drum length and diameter factors that create machining problems on horizontal turning equipment are eliminated by vertical work mounting on the Hypro machine table. Ample swing for large capacity is provided for different diameter drums or any type of cylindrical and odd-shaped workpieces. Clearance under the rail also simplifies machining operations and part setup.

Right and left hand threading and drum scoring after cylindrical surfaces have been turned is accomplished by using a standard thread cutting attachment for this purpose. Quadrant and gears for this attachment is mounted on the machine rail convenient to the operator. In operation the hoist cable drum is placed on the machine table and one end is bored. A precision trunnion pin is mounted in one rail head fitting into this bore to center the workpiece. The second head is then engaged to perform the various operations required.

Competent Engineering Assistance

Experienced Cincinnati Hypro engineers will gladly co-operate with you in determining how your work can be completed faster and better. Recommendations will be made upon receipt of details or prints, if the latter are available. Or, if you prefer, call in a company field engineer and outline your problem.



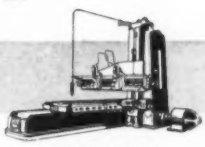
Taper turning a large ring gear for a power shovel. This is a typical job for the Cincinnati Hypro vertical mill.

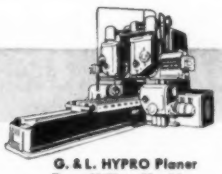
numerous types of work quickly handled...

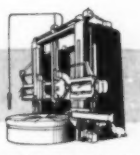
The machining versatility and range of the Cincinnati Hypro Vertical Boring and Turning Mill makes it possible to complete many turning, boring, grooving, recessing, facing and similar operations on a broad variety of work. Large, awkward pieces can be mounted on the machine table and rotated. Rail and side heads are quickly and easily adjusted for the different machining operations. This wide work latitude may solve some of your present manufacturing problems.

MACHINE TOOL COMPANY
WISCONSIN, U. S. A.

G. & L. HYPRO
Double Housing Planer


G. & L. HYPRO
Openside Planer

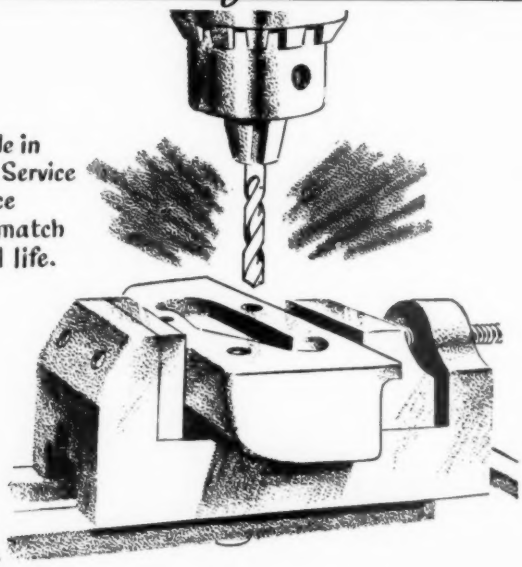

G. & L. HYPRO Planer
Type Milling Machine

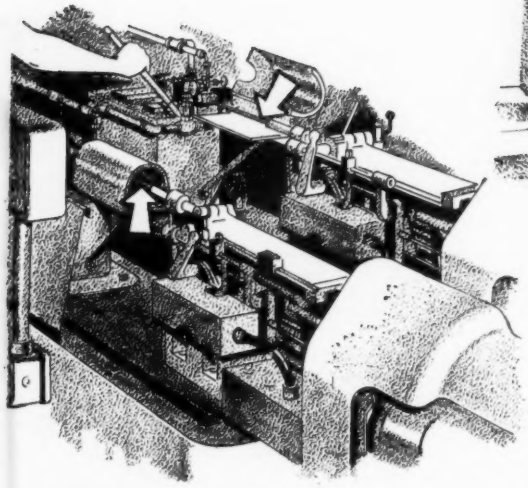

G. & L. HYPRO Vertical
Boring and Turning Mill

DAVIS
Complete Tooling Service

DRILLING POINTERS.....by Red Shield

ALLOY STEEL. Drilling 3 5/64 hole in alloy steel forging. Red Shield Service Engineer recommended a surface treatment and special point to match the job. More than doubled tool life.





SAVES $30 PER DAY. Special drilling machine with four deep-drilling heads for drilling 7/32-inch diameter hole, 14 inches long in chrome-nickel-moly steel shaft. Red Shield Service Engineer recommended special crankshaft drills with suitable surface treatment. Machine has cut tooling cost in half. Overall savings estimated $30.00 per day.

SERVICE. There's 70 years' Standard experience behind our Red Shield Service Staff to help solve your metal-cutting problems. Simply call your Standard Tool Co. distributor.

STANDARD TOOL CO. DEPT. 4-A, 3930 CHESTER AVENUE CLEVELAND 14, OHIO

STANDARD TOOL CO.

New York • Detroit • Chicago • San Francisco

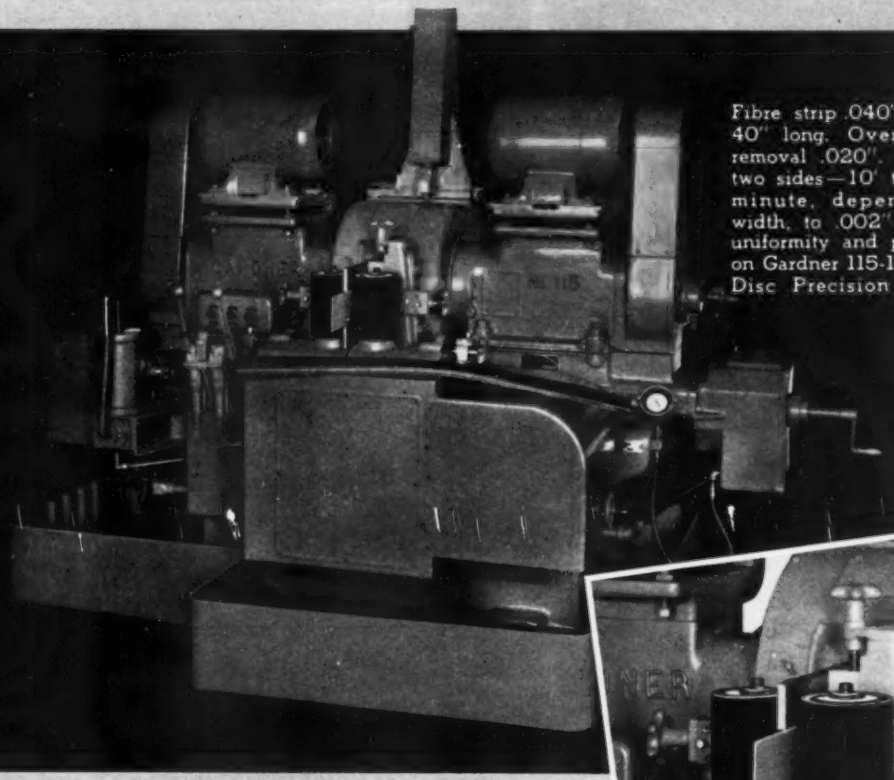
THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

Now

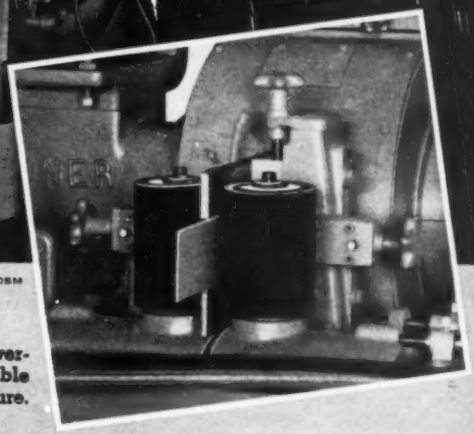
Grind Parallel Sides of .040" Thin Strip at Low Unit Cost

GARDNER Precision disc Grinders

Production increased by grinding TWO surfaces in ONE operation



Fibre strip .040" thin and 40" long. Over-all stock removal .020". Grinding two sides—10' to 24' per minute, depending on width, to .002" limits for uniformity and parallelism on Gardner 115-18" Double Disc Precision Grinder.



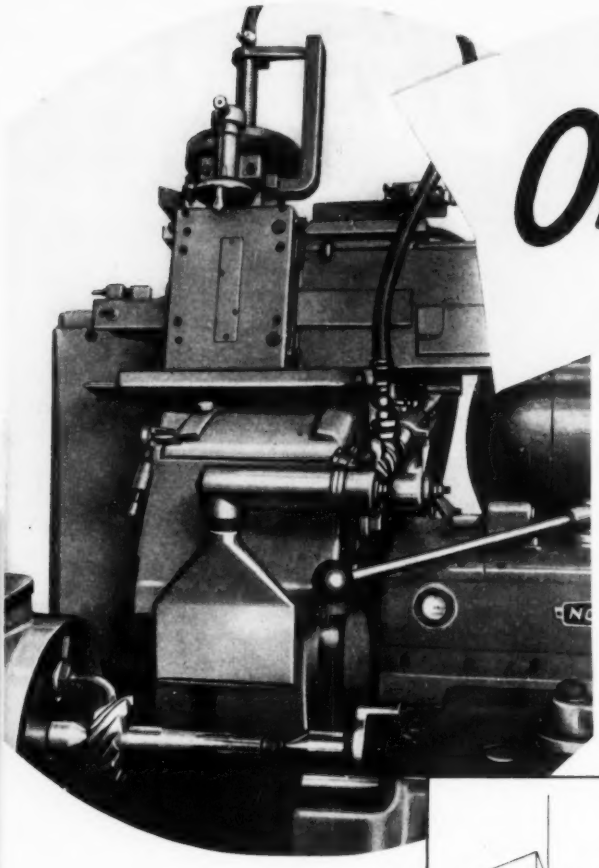
Hand feed to power-operated adjustable roll feed-thru fixture.

10SM

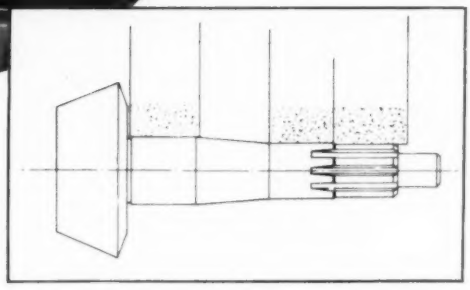
Request bulletin No. 12-7.

GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.



One will



Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS., U. S. A.

DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

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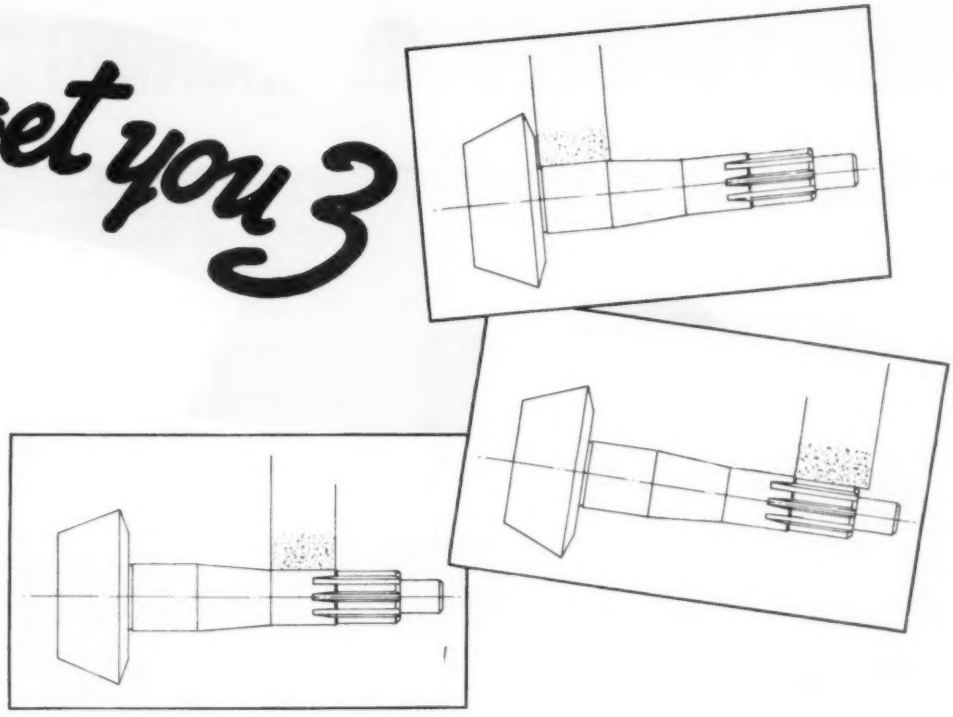


One NORTON

10" TYPE CTU SEMIAUTOMATIC

Replaces 3 Machines . . . 3 Operations
Increases Production 128%

The Problem: to improve the method of producing an automotive part which required grinding on three different diameters. The old method required three operations on three machines and produced only 35 parts per hour.

The Recommendation: Norton engineers suggested replacing the three old-type machines with one new Norton 10" Type CTU Semiautomatic Grinder with multi-wheel mount and automatic truing device — wheel guard type.

The Result: the new Norton Grinder accurately performs all three operations simultaneously at the rate of 80 parts per hour — a production increase of 128%!

To Economize Modernize with a NEW **NORTON**
GRINDERS and LAPPERS

HOW TO SPEED UP TRAINING OF

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

MILLING MACHINE OPERATORS

Kearney & Trecker Visual Training Aids can

Save Time Training Operators

Help Train Supervisory Personnel

Improve Vocational School Machine Shop Courses

As a service to industry and education, Kearney & Trecker offers three popular visual aids to complement your training of milling machine operators.

It's no wonder the demand for these visual aids is big. They help you train operators faster . . . do a more complete job. They help you do the kind of training that saves money out in the shop—speeds up schedules and minimizes costly mistakes.

We urge you to send for these aids now while we still have an ample supply. Look over the descriptive material below and send for the ones that can help you.

● **FILM COURSE.** We will loan you, without charge, a complete sound-slide, five-part training film (in color) which deals with good machine tool practice. Special emphasis on the use and purpose of milling machines. Complete with instructor's guide.*

● **ELEMENTARY HANDBOOKS.** Kearney & Trecker's MILLING PRACTICE SERIES of booklets are highly popular with teachers, students and machine operators alike. Book I, "The Right and Wrong in Milling Practice," covers operation of the milling machine including job setup, taking the cut, selection and care of cutters, general housekeeping and safety precautions.

Book II, "The Milling Machine and Its Attachments" covers the principles of modern milling machine design. Attachments and construction and their basic uses are covered also.

The nominal charge of 50¢ each for Books I and II is many times repaid with the help you get from these simple, dramatic presentations of a highly technical subject. The remittance should be made out to Kearney & Trecker Corp., Milwaukee 14, Wis. Send check or money order. No C.O.D.'s or stamps please*.

● **POSTER STUDYVIEW OF UNIVERSAL STYLE MILLING MACHINE.** This big 40" x 60" color studyview of a universal milling machine gives the beginner in shop practice a clearly defined illustration of the machine, its basic construction and the basic elements of operation and maintenance. There is no charge.*

*All applications for visual aids should be made on official company or school letterhead. If coupon is used, your name and title should be submitted together with an official letterhead. Trainees can make individual purchases of Books I and II without official letterhead. Instructors can make group purchases of Books I and II as desired.

Kearney & Trecker Corp., Milwaukee 14, Wisconsin

Please send me:

- ☐ Applications for loan of sound slide training film. No charge.
- ☐ Book I, "Right and Wrong in Milling Practice". 50¢ enclosed.
- ☐ Book II, "The Milling Machine and Its Attachments". 50¢ enclosed.
- ☐ Poster Studyview of Universal Style Milling Machine. No charge.

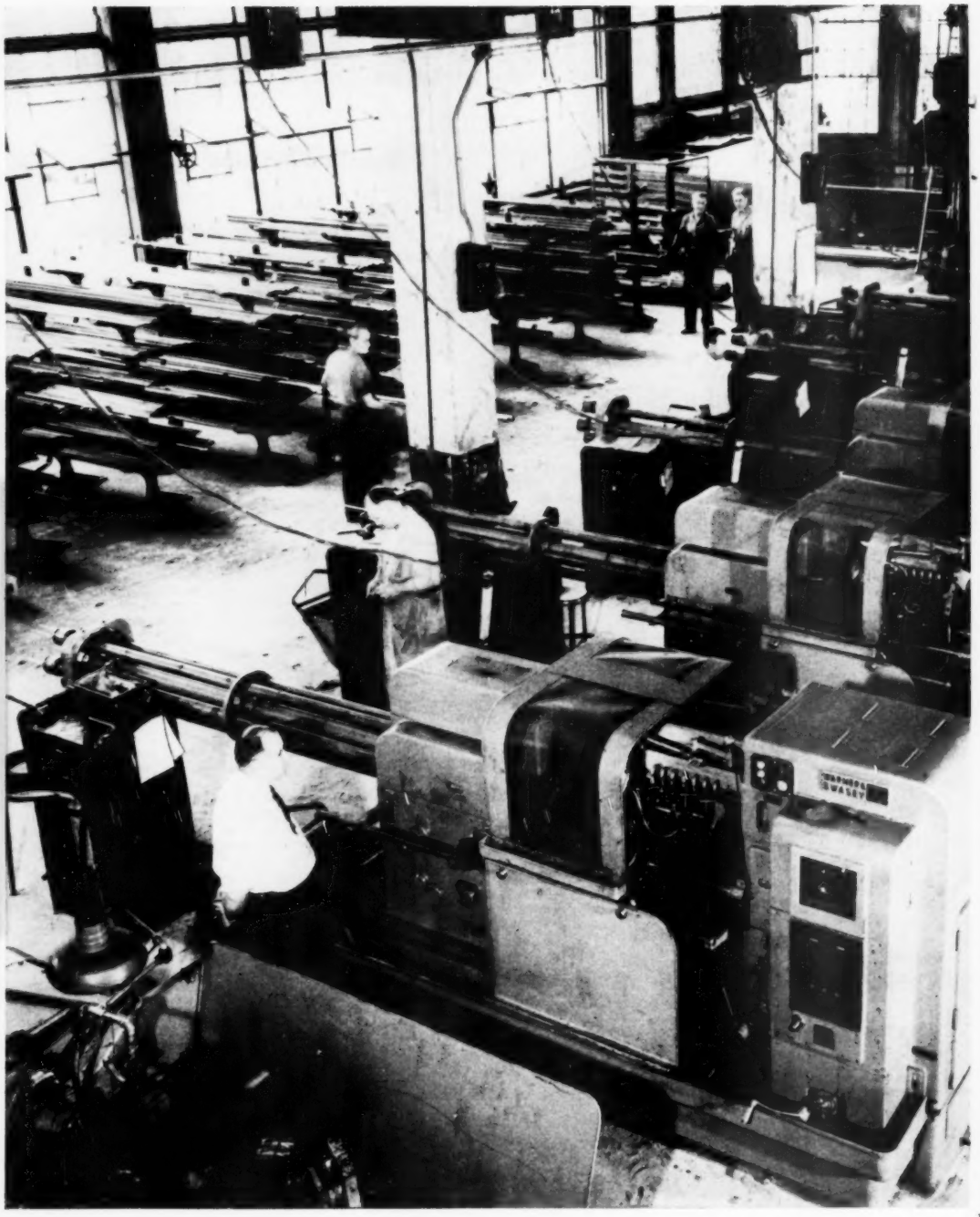
I am enclosing my official company letterhead.

Name_____

Title_____

Company_____

Address_____



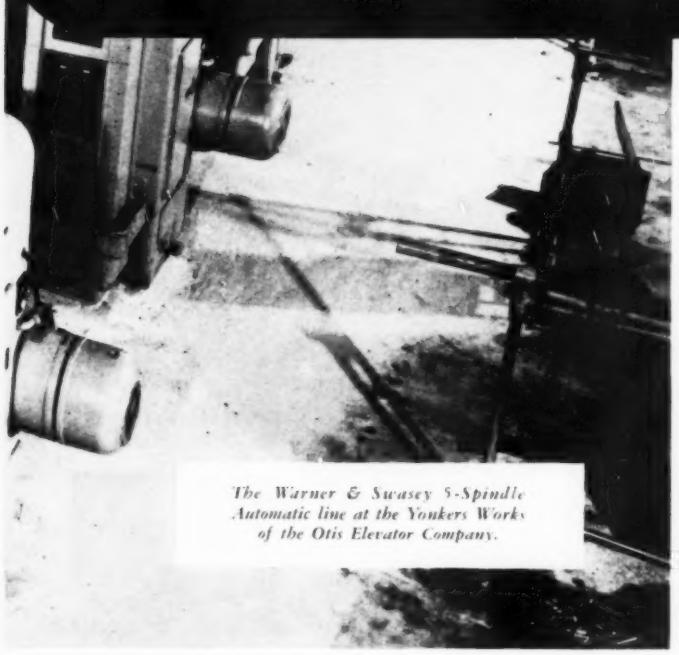
YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

One manpower problem solved

BY WARNER & SWASEY AUTOMATICS

• At Otis Elevator Company, 6 Warner & Swasey 5-spindle Automatics replaced 17 older machines—and 6 critically needed men were released to work elsewhere in the plant.

These automatics are used at Otis for short runs on specially machined parts—studs, bolts, nuts and other screw machine products—required for custom-made elevators. And only 3 men are required to set up and operate these 6 automatics—an important point to consider in today's tight manpower market. Parts are now more uniform, and are produced at a higher rate.



The Warner & Swasey 5-Spindle Automatic line at the Yonkers Works of the Otis Elevator Company.

If manpower is one of *your* problems—or if you need new machines to keep pace with present day production demands—have your Warner & Swasey Field Engineer show you just how automatics can fit into your production setup.

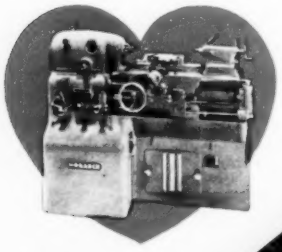
WARNER & SWASEY
Cleveland

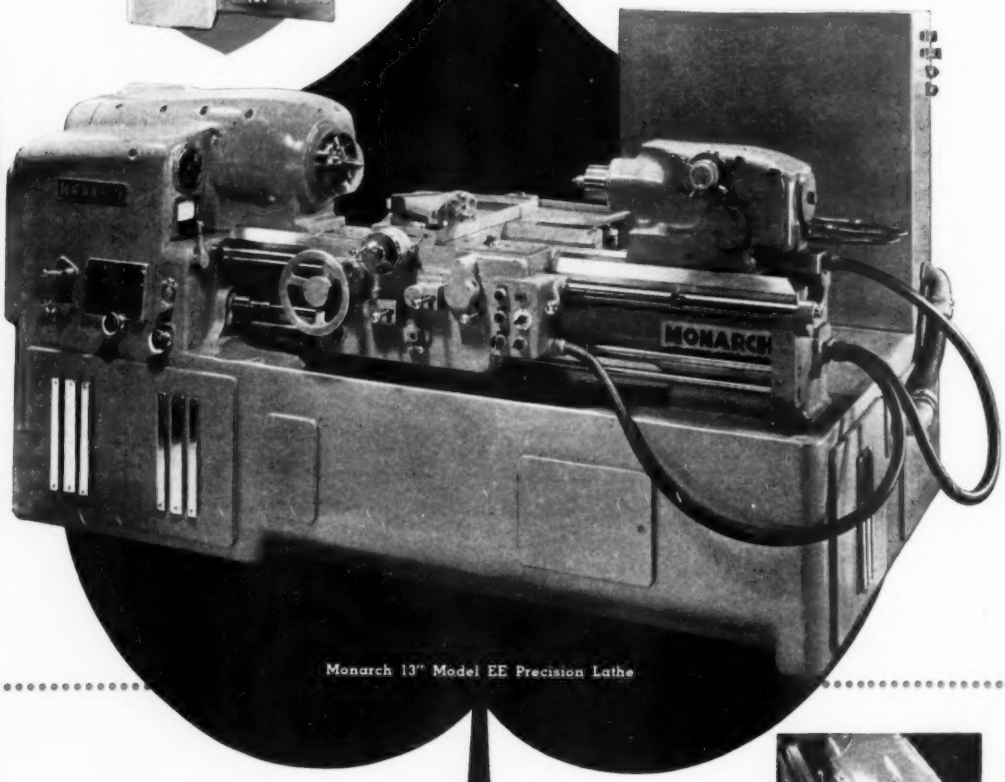
& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

This One New

You're acquainted with this sweetheart—the 10" Monarch Model EE—one of the most popular lathes ever built. Over 6,000 in use.

Now—Monarch introduces the EE's big brother—the larger lathe you have been asking for. Not simply a larger EE, this new lathe embodies features never before perfected and combined in any lathe.





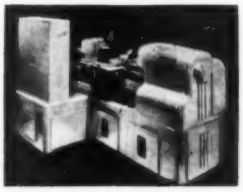
Monarch 13" Model EE Precision Lathe

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

The mere touch of this button unclamps the 385 pound tailstock —a slight push or pull moves it along the bed while release of the button reclamps it. Its 3¼" diameter spindle is indicative of the strength built into the entire machine.

Ace Takes EVERY Trick!

Toolmaker's Lathe! Manufacturing Lathe! The New MONARCH 13" MODEL EE PRECISION LATHE is a Standout in Both Roles



Here's the first and only truly dual purpose lathe ever made!

In the toolroom, it provides toolmaker's precision—plus a new high standard in amount of work output. On manufacturing operations, it slashes turning time unbelievably, with no sacrifice of its basic accuracy. For more profitable performance in *each* use, and unequalled performance in *both*, the Monarch 13" Model EE is your answer for practically every type of turning.

Everything about this machine represents fresh engineering thinking. Consider these features.

1. Built-in constant surface cutting speed. Becomes operative at the flick of a switch. With it, the operator is *always* using the most efficient cutting speed. Finish and accuracy are improved; turning time on some facing operations can be reduced up to 50%.

2. All-hydraulic tailstock. Nothing like it on any other lathe. Hydraulic positioning and clamping permits almost effortless repositioning of this 385 lb. unit in a matter of a few seconds. Hydraulic feed and traverse to the spindle. Drilling and reaming operations performed with a quickness and ease never thought possible heretofore.

3. Infinitely variable speeds up to 2000 R.P.M. In four overlapping ranges and provided by a 15 H.P. variable speed motor. The number of speeds is limitless—the one which is ideal for the job at hand can always be secured. High speed range direct to spindle through multiple "V" belts for the ultimate in high finish performance.

4. Electrical speed change. It's practically instantaneous. The turn of a knob gives every speed within a given range; change-over from one speed range to another is automatic immediately upon resetting of selector knob. No calculating of lever settings by reference to an index plate. Nothing could be as simple, as quick, as positive.

5. Four-way rapid tool traverse. Cross traverse in and out and longitudinal traverse right or left provided by individual motor drive. Tool repositioning couldn't be made easier or faster.

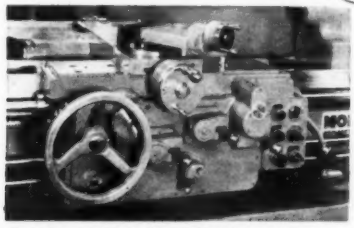
6. Flexibility unlimited. It's difficult to find a lathe job which the 13" Model EE cannot handle. There are 66 thread and feed changes. Regular equipment includes a ball bearing taper attachment, direct length reading dial, thread chasing stop, apron controlled leadscrew reverse with automatic stop in both directions, steady rest and follow rest.

Surely, you'll want to know more about this lathe whose features place it in a class all its own. The complete story is in booklet No. 502. Just fill in the coupon and we'll send it gladly.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES



Complete control of the machine is concentrated at the apron which is always convenient to the operator. Besides the usual controls found on conventional lathe aprons, this one is provided with complete control of the four-way rapid tool traverse, the built-in constant surface cutting speed and full electrical control of the speed change and the work drive motor. Add to this also the apron controlled leadscrew reverse.

THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO

Gentlemen:

Please send me without obligation your Booklet No. 502 giving full information and description of the Monarch 13" Model EE Precision Lathe.

NAME _____

COMPANY _____ TITLE _____

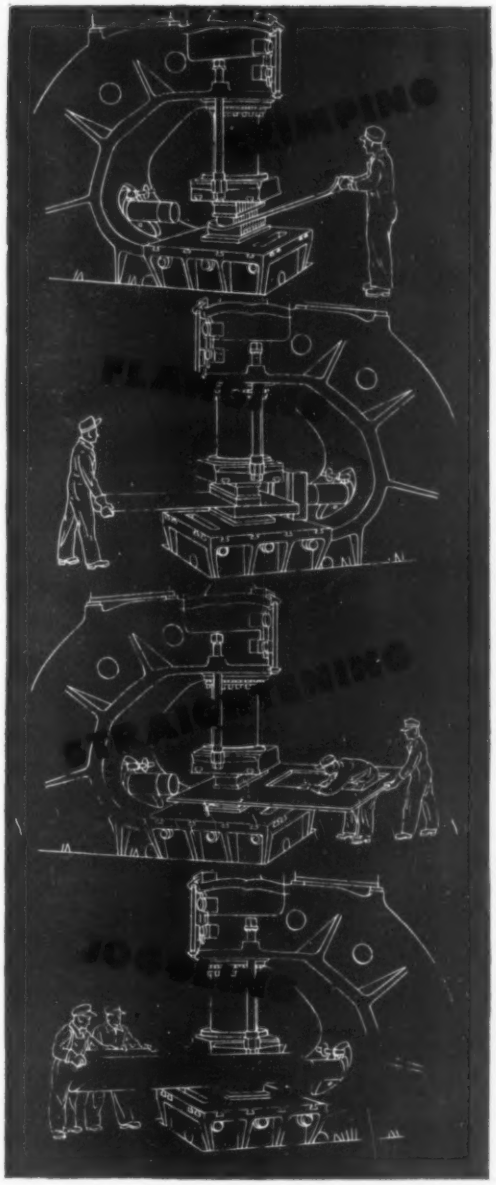
ADDRESS _____

CITY _____ ZONE _____ STATE _____

BALDWIN

THIS BALDWIN PRESS

does many jobs well



This Baldwin 400-ton gap type press will quickly earn the blue ribbon as the most versatile, profitable and helpful piece of equipment in your shop. It handles crimping, flanging, straightening and joggling operations rapidly and precisely, helps to expedite the flow of orders and produces at a rate that spells better profits.

Baldwin's Hy-speed Hydraulic System adds a big plus to the performance of every Baldwin press. The speed of the ram in every portion of the stroke, as well as the length of "dwell," is under continuous and complete operator control. An important refinement is found in the packing, which automatically adjusts itself to the pressure to which cylinder and ram are subjected. Re-packing can be done from the outside, without any necessity for major dismantling. The safety of the operator is given top consideration, with automatic stoppage of the slide in case of power failure—complete auxiliary manual control even in the cases of semi-automatic or automatic operation . . . and instant stoppage in case of emergency, and return of ram to top position.

Details are given in Bulletin 285, sent on request. A representative will be glad to consult with you, and work out the type of press best suited to your needs.

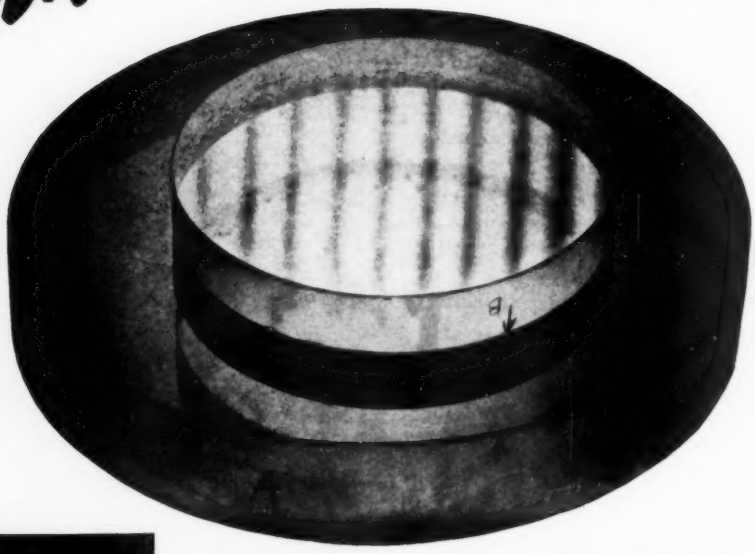
BALDWIN-LIMA-HAMILTON CORPORATION
Philadelphia 42, Pa.
Offices in Principal Cities

BALDWIN · BLH · LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON
HYDRAULIC PRESSES

Van Keuren OPTICAL FLATS
are the proof of Precision

BOSTON



NEW YORK

Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

CATALOG AND HANDBOOK No. 34

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

Operators acclaim it as a money maker!

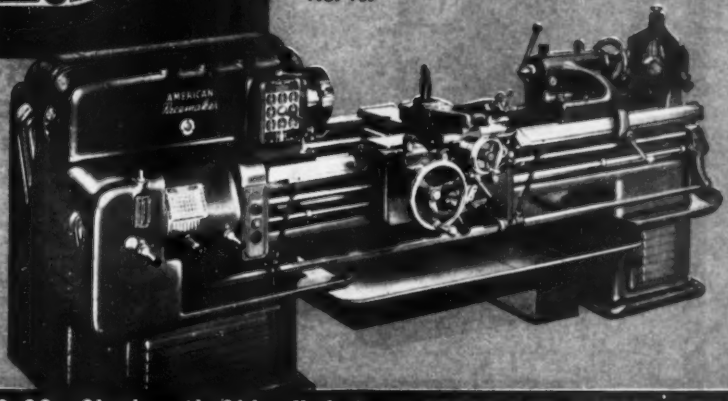
Whenever operators enthusiastically acclaim a feature as a money maker for them it automatically follows that it is likewise a money maker for the owners.

The direct reading speed control of "AMERICAN" Pacemaker Lathes is a real money maker and operators freely admit it. It makes their work easier; they can secure the right speed quicker; they produce more work because of it and, what is of paramount importance, the pay roll dollar buys more as a consequence.

The direct reading speed control unit shows at a glance the available speeds and the simple means of securing them. Imagine 27 spindle speeds being secured through only two conveniently placed direct reading levers without having to refer to index plates or having to retain lever positions in mind.

Furthermore, the simplicity of this mechanism and the infinitesimal time required to make speed changes inspire operator confidence and encourage him to make changes necessary to secure correct cutting speeds.

This and other fine features of the "AMERICAN" Pacemaker are thoroughly illustrated and described by Bulletin No. 16.



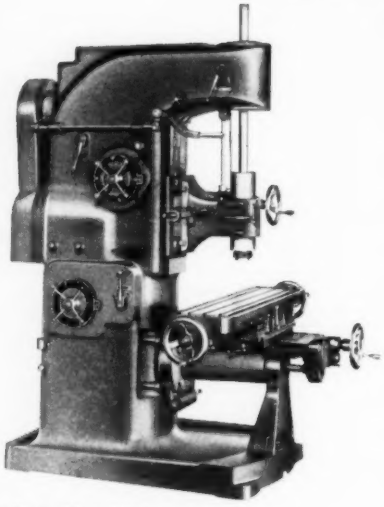
THE AMERICAN TOOL WORKS CO., Cincinnati, Ohio, U. S. A. LATHES AND RADIAL DRILLS

Here May Be Your Answer To

KNIGHT EQUIPMENT OFFERS

For Savings In Manhours And

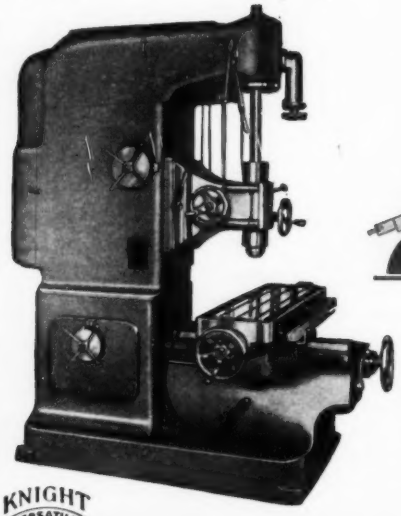
Here are machines noted for their speed, accuracy, versatility, simplicity and ease of operation —single precision-engineered units that can do the work of two or more special purpose machines but which demand a far lower initial investment —machines which have won such an outstanding



Smaller machines of this type, No. 30 and No. 20, are also shown in the Knight Catalog

No. 40
MILLING & PRECISION BORING MACHINE

A fast, versatile, powerful universal machine for both large and small jobs. Its tilting, swiveling table makes the use of expensive special jigs, angle plates or other fixtures unnecessary. 16 Table and spindle feed changes plus 4 vertical spindle feeds offer the most efficient use of small and large tools and cutters. One-piece column, wide bearing surfaces and precision gearing promise the most in accurate, effortless operation. Easy-to-reach controls for table direction, speeds and feeds — quick cutter changes at spindle nose — direct-reading speed and feed change dials — are only a few of the features that provide more efficient precision milling and boring.



No. 50
PRECISION BORING & VERTICAL MILLING MACHINE

A single solid base, fast, accurate machine of large capacity. Eliminates extra setup time and unnecessary work transfers. Exceptional cross and longitudinal table travel, large throat capacity plus long spindle travel provide a working range far greater than other machines of comparable size. Solid bed type construction for fast, heavy cutting — convenient controls — a complete range of feed and speed changes — all offer every opportunity to lower costs and raise profits.

KNIGHT — VERSATILE · ACCURATE · RIGID · MILLERS

MORE GOODS for MORE PEOPLE

Lower Costs & Higher Output!

UNUSUAL OPPORTUNITIES!

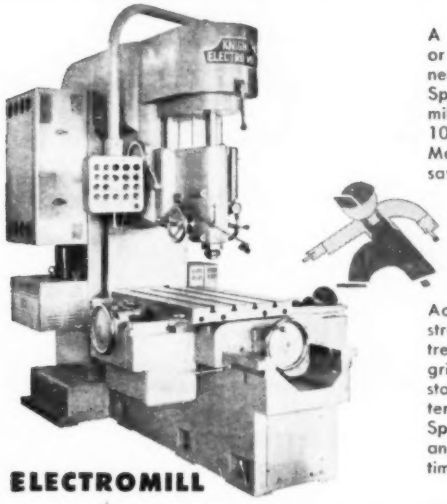
Money, Plus Improved Quality

reputation for performance during 40 years of service that 66⅔% of all orders for Knight Equipment come from present users!

Knight Equipment can help you — to conserve labor — eliminate lost motion — lower unit costs — raise production. Write today for information!

20"
ROTARY TABLE
for Rotary Milling & Indexing

A self-contained motor-driven unit for use on any milling machine or horizontal boring mill. Eliminates all setup time. Operates off nearest electric outlet. No other equipment or connections required. Special geared-down motor provides ample power for almost any milling job. Eighteen quick feed changes from 1½" to 54" or 3" to 108" per minute. Automatic positioning and feed cycle are optional. May also be used wherever an automatic revolving fixture would save time and labor.

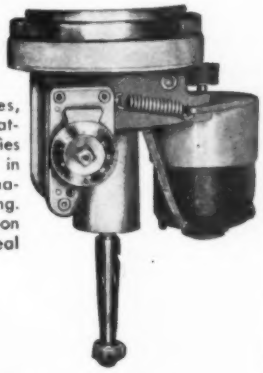


ELECTROMILL

A heavy duty vertical milling, drilling and boring machine for handling a wide range of large capacity work. Design permits elimination or inclusion of many features, speeds and feeds to meet any special requirement. Extra heavy table and saddle travel on rollers for easy operation. Deep throat provides exceptional capacity — long spindle bearings assure extra accuracy. Gearless smoother drive — complete machine controlled from a single panel that can be positioned for most convenient operation — safety features to protect work and operator — plus other fine engineered features offer a real investment in cost-cutting.

HOLE GRINDING ATTACHMENT

Accurately and quickly enlarges, straightens and finishes holes in heat-treated and hardened parts. Simplifies grinding work too large to swing in standard machines. Grinds holes in material too tough for smooth boring. Special adaptors permit installation on any milling or boring machine. A real time and labor saver.



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W. B. Knight Machinery Co.
3920 West Pine Blvd.,
St. Louis 8, Missouri.

Send complete details and prices on the following Knight Equipment:

_____

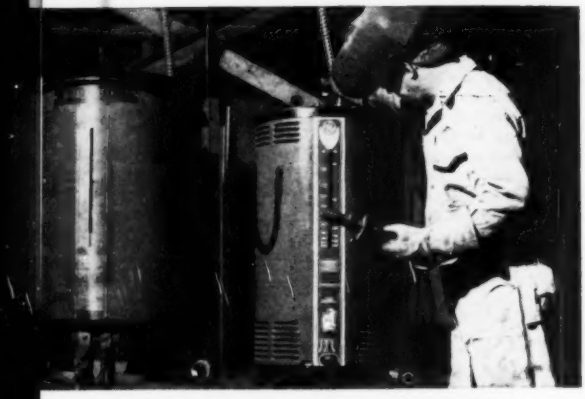
Name_____

Title_____

Here, Alco welders help meet production schedules on locomotive frames, vital to defense, by using G-E a-c welders. AC welders eliminate troublesome arc-blow encountered when welding high-tensile steels with d-c equipment.

100% A-C WELDED!

Here's How Alco Produces Road Locomotive Frames with G-E Welders



Shown above are two of the many G-E a-c welders used at Alco.

Corners can be difficult to weld, but the absence of troublesome arc-blow with G-E a-c welders enables this operator to lay an even corner bead in any position.

Diesel-electric road locomotive frames are 100% a-c welded at the Schenectady, N. Y., plant of American Locomotive Company. Alco welding engineers report that General Electric a-c welders eliminate troublesome arc-blow, make for easy striking, cost less than d-c, use less power and are easily maintained.

Like the American Locomotive Company, you may also find that you can speed production by using G-E a-c welders. For example . . .

YOU CAN WELD BETTER WITH AC

You have complete control of the arc in all positions because G-E a-c welders eliminate troublesome arc-blow. This reduces the danger of undercutting and slag inclusions and produces better welds.

YOU CAN WELD FASTER WITH AC

In almost every case you can use higher currents and larger electrodes. That means more footage. Users report increases of 10 to 50%.

YOU CAN WELD AT LOWER COST WITH AC

G-E a-c welders cost less than d-c equipment of the same rating. They use only one-fourth as much power when idling and have much lower load losses. And because there are no rotating parts, maintenance is practically negligible.

SEE YOUR G-E WELDING DISTRIBUTOR!

He's listed in the yellow pages of the telephone directory. Just look for General Electric under "Welding Equipment." Your distributor carries a complete line of welders, accessories and electrodes. General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

711-17

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Why Gisholt's Recommendations Are Unbiased. In helping you solve your turning problems, Gisholt engineers have no reason to favor one type of machine over another except on the basis of its ability to best serve your needs. For Gisholt manufactures both manually operated turret lathes and automatic lathes.

FASTERMATIC KEEPS 8 CUTTING TOOLS BUSY TO TURN OUT FORGED PARTS IN A HURRY

Job Requires Rough and Finish Machining on All Surfaces

The trick here was to turn these steel forgings into top slips for oil well equipment in the fastest, lowest cost way. The nature of the cuts—both straight and taper bores . . . facing . . . inside deep grooving . . . and two chamfers—indicated that the 2F Fastermatic Automatic Turret Lathe was a "natural" for the job.

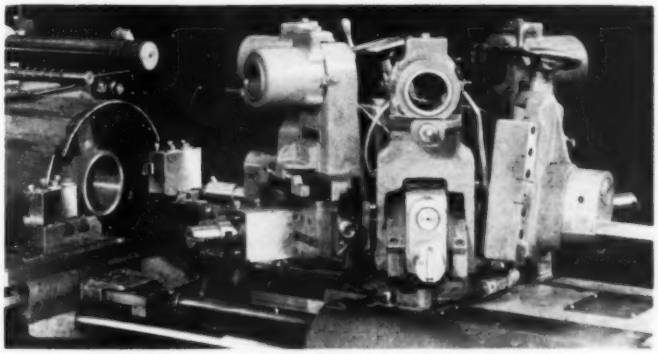
All this work, both rough and finish cutting, calls for all six hexagon turret faces, and the individual front and rear cross slides . . . 8 tool approaches to the work.

The operation starts with rough boring of the ID from first turret station. At the same time, the front cross slide rough faces. Next, the rest of the ID is rough tapered by a slide tool mounted on the second turret station and which is guided by a cam on the rear cross slide.

Maximum Use of Standard Tools

Indexing to the third turret station, the straight bore is finished, while finish facing is handled by the rear cross slide. Rough grooving in the straight bore follows. A standard grooving tool on turret station four reaches in for this deep operation. This tool is actuated by a stop on the headstock which causes it to feed to depth while the turret feeds forward.

At station five, tools similar to station two finish the taper bore and chamfer the inner edge. Winding up the job, a grooving tool at station six (as at station four) finish grooves and makes a small bevel in the inner groove.



Tooled up to turn out 5" top slips, this Fastermatic keeps 8 tool stations working at top efficiency.

At right the rough forging. Center view shows taper and after machining. At left is the same part reversed.

The whole job takes only 5.5 minutes, floor-to-floor—with the machine's automatic cycle allowing the operator to handle other work on a second Fastermatic. It's another example of how the flexible standard tooling and automatic speed and feed changes make the Fastermatic ideal for high efficiency output where a variety of diameters and straight and angular surfaces are machined.

With all tool stations working, the Fastermatic performs all rough and finish facing, straight and angular boring; and grooving operations on these parts in a single chucking—fast.

FOR MORE PRODUCTION FROM

A CLEAR-CUT CASE FOR RUGGED DESIGN

New Saddle Type Turret Lathe Cuts Time ⅔

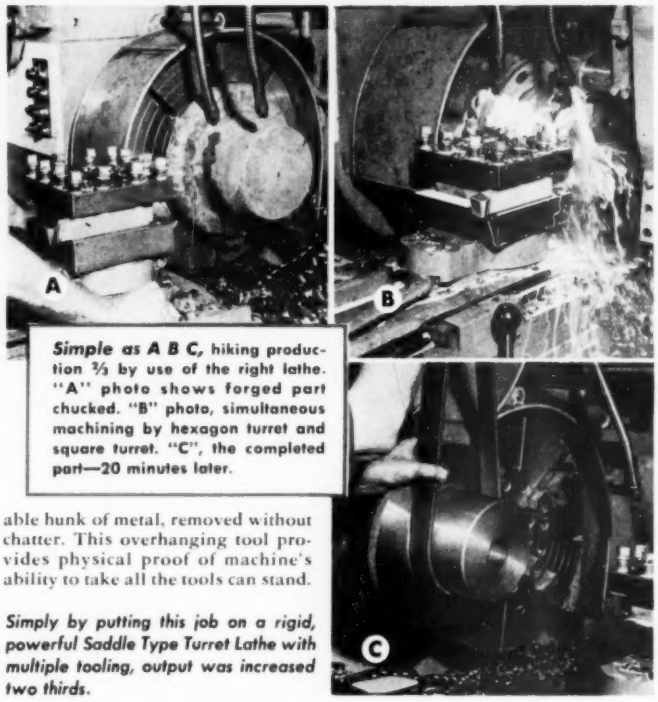
If you want convincing evidence of what rigidity and pulling power can do to costs, this is it.

This manufacturer formerly machined these companion flanges on an older type machine. Parts are mild steel hammered forgings, which measure 7½" on the body and 12½" on the flange. Production dragged along at one part per hour. The other lathe couldn't take over one cut at a time.

Now, with the job on a Gisholt 3L Saddle Type machine, *three* parts are finished in the same time. The big difference lies in sheer power and rigidity.

The part is chucked on the large OD. Tools in a multiple turning head simultaneously rough the OD and ID of the body. Finishing is handled in the same manner from the second turret station. Tools on the quick indexing square turret do the facing, chamfering and radius at the same time the hexagon turret is working.

On the turning cut a 1¼" carbide tool bit removes up to 1⅛" on the side with a .019" feed. That's a sizable hunk of metal, removed without chatter. This overhanging tool provides physical proof of machine's ability to take all the tools can stand.



Simple as A B C, **hiking production ⅔ by use of the right lathe. "A" photo shows forged part chucked. "B" photo, simultaneous machining by hexagon turret and square turret. "C", the completed part—20 minutes later.**

Simply by putting this job on a rigid, powerful Saddle Type Turret Lathe with multiple tooling, output was increased two thirds.

THIS KIND OF PLANNING PAYS OFF

With Proper Tooling Ram Type Lathe Handles 6 Different Parts for One Assembly

Careful planning pays off on any job, of course. But here's an outstanding example of it—for machining six different parts of the same assembly—where precision is required but total quantity doesn't warrant a high production setup.

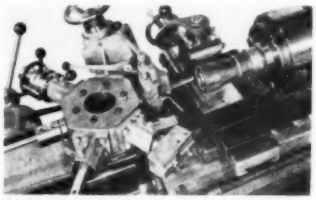
Tooling is smartly planned for the Gisholt No. 4 Ram Type Turret Lathe so there is fast changeover for handling all the pieces. The air chuck with special fixtures is quickly and easily adapted for both internal and external holding.

External work and facing are done by tools on the quick indexing square turret on the cross slide carriage. Tools for the hexagon turret, which do all internal work, are shown in the photo. These handle precision machining on all six of the parts.

The internal machining of these six different parts for one assembly is all handled by this one group of tools (right) on the hexagon turret.

Yes, well planned tooling can solve production problems. Good reason why you should check with Gisholt for the tools that can help cut your machining time and costs. Ask about them.

The machining of six different parts is planned around one set of tools. This user is time and money ahead.



One of the parts set up in the No. 4 Ram Type Turret Lathe.

GISHOLT

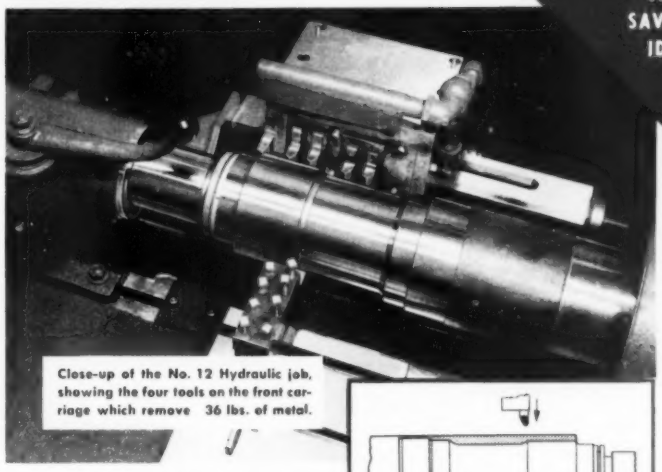
PARTS GET QUICK TRIMMING *(36 LBS. OF METAL)* BY NO. 12 HYDRAULIC

4 Tools Team Up to Make Deep Cut on Same Surface

Here's a way to hog off metal with real finesse—the way this No. 12 Hydraulic Automatic Lathe brings parts down 36 lbs. to size. There is too much depth of stock on these 7½" N.E. 8640 cylinders for one tool to remove in a single pass (shaded area of drawing), so the job is divided among four tools.

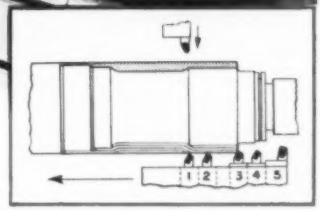
Tools are mounted in individual cam controlled sliding tool blocks on the longitudinally feeding front carriage. As each tool reaches the position shown by the first tool (see drawing), it is cammed inward to follow the required contour. Since the tools are successive, they follow the depth lines shown in the drawing. The fifth tool finishes the large OD at the right end, and the single tool on the rear carriage forms the right radius.

With work being done at 265 f.p.m. and .015 feed, the floor-to-floor time for removing 36 lbs. of metal in this operation is eight minutes flat. Because tool load is moderate by this successive cutting arrangement, tool life is excellent. Also, the same operator handles another No. 12 Hydraulic which does the other end of the cylinders. Write for the new No. 12 Catalog. It shows 28 different examples of jobs handled on this machine.



Close-up of the No. 12 Hydraulic job, showing the four tools on the front carriage which remove 36 lbs. of metal.

In four successive contour cuts, with cam-controlled slides, this No. 12 Hydraulic brings cylinders down to size in a single automatic operation.



The shaded area at top shows total metal removed by successive cuts from tools 1, 2, 3, 4 at bottom. Fifth tool finishes large OD at right of cylinder.

FRONT, BACK AND INSIDE OF HEAVY PIPE FLANGES MACHINED AT SAME TIME

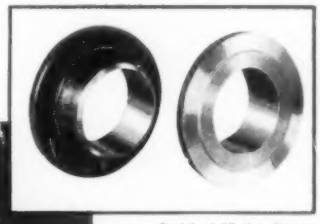
Entire Job Done in Single Chucking

Note this efficient setup for machining heavy duty steel pipe flanges on a Simplimatic Automatic Lathe. See how it's planned for simultaneous machining of all surfaces—front, back and inside?

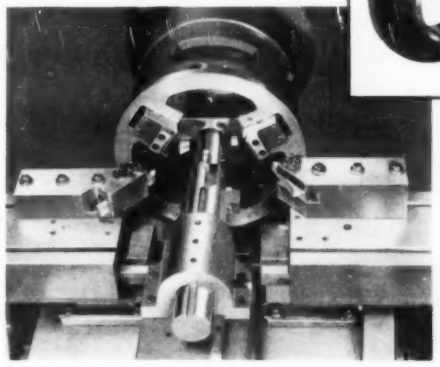
The part is held on the hub with a special fixture. Piloted tools on the center slide rough and finish bore and chamfer. The two back tools, which are operated through the spindle, face and chamfer the neck. Tools on the front and rear slides rough and finish the two flange steps.

All cuts are simultaneous—with the 8" pipe flanges being finished in one operation at a rate of one part every 3.7 minutes, floor-to-floor. Another good example of the Simplimatic's ability to cut time and costs on all types of jobs.

This manufacturer profits from the adaptability of the Simplimatic by rough and finish machining all surfaces of these pipe flanges in one operation.



Finished 8" pipe flange.



This tool planning you see here enables this manufacturer to machine both ends and inside of flanges at same time.

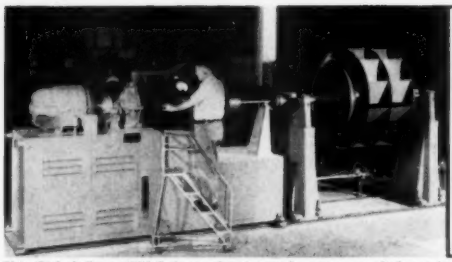
TIME-SAVING IDEAS

LARGE BLOWERS STAY QUIET, LAST LONGER THROUGH PRECISION BALANCING

Unbalance Located and Measured; Correction and Re-check Made on Balancer

There's mighty slim chance for noise, vibration and excessive bearing wear in the large blowers which The Trane Company, La Crosse, Wisconsin, fabricates for its air-conditioning systems. Precision balancing on Gisholt Balancing Machines does away with these hazards.

The large blowers, in sizes up to 60" and weighing up to 3 tons, are balanced on the Type 6UH machine shown here. Balancing is done right on their installation shafts—with the work supports quickly adjustable to each shaft length by movement along the track set in the floor.



This Gisholt Type 6UH Balancer locates and measures unbalance in various size blowers.

Design for Balancing Covered in Gisholt Balancing School

How to design rotating parts for fast, economical balancing is just one of the broad range of subjects covered fully in the Gisholt Balancing School. New classes start on November 5th and December 3rd. Write for complete information.

In operation, each unit of unbalance shown on the amount meter equals 0.1 oz. of correction weight. There's no computing necessary on the part of the operator . . . he merely reads the amount of required correction. When the amount and location of unbalance are determined, steel corretion washers are welded at the indicated points and the part is checked for accuracy of balance.

This entire blower balancing job is handled in one operation and by one machine in fast time.

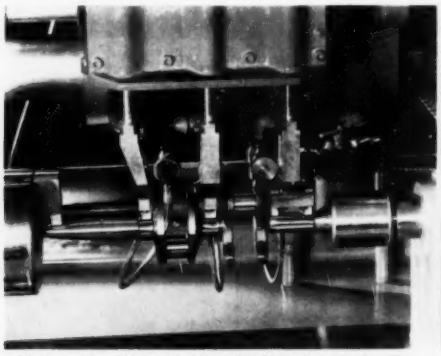
DYNETRIC BALANCERS

IT'S A BIG ADVANTAGE FOR THESE LITTLE CRANKSHAFTS

Two Superfinishers Quickly Handle All Bearing Surfaces

Because these outboard motor crankshafts seem peanut size compared to the others you know, you may think Superfinish is unnecessary. But, this manufacturer knows it's just as vital for better performance and longer life as for big-brother crankshafts in automotive and locomotive engines.

The r.p.m.'s of these little two-throw crankshafts are very high, and the bearing loads are severe. To Superfinish both the crankpin bearings and main bearings, two Superfinishers are used. The benefits are many—removal of grinding chatter marks . . . simplified grinding and lower grinding wheel costs . . . improved geometry . . . and simplified assembly because the resultant "base metal" requires no break-in tolerance.



Close-up of machine with 3 Superfinishing stones for handling crankshaft bearing surfaces.

This second Superfinisher does the crankpin bearings.

What does Superfinishing add to production time and costs? Not a penny . . . there are 25 hours per thousand crankshafts for grinding time and the same for Superfinishing. That's actually a 35% improvement over the former rough and finish grinding time. And the job is far better, too.

Your complimentary copy of the booklet, *Wear and Surface Finish*, will make you an expert on the subject of Superfinish. Write for it.

Superfinish pays big dividends on these little crankshafts by actually cutting grinding time as well as insuring better fits, longer life.

No. 1051
577

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

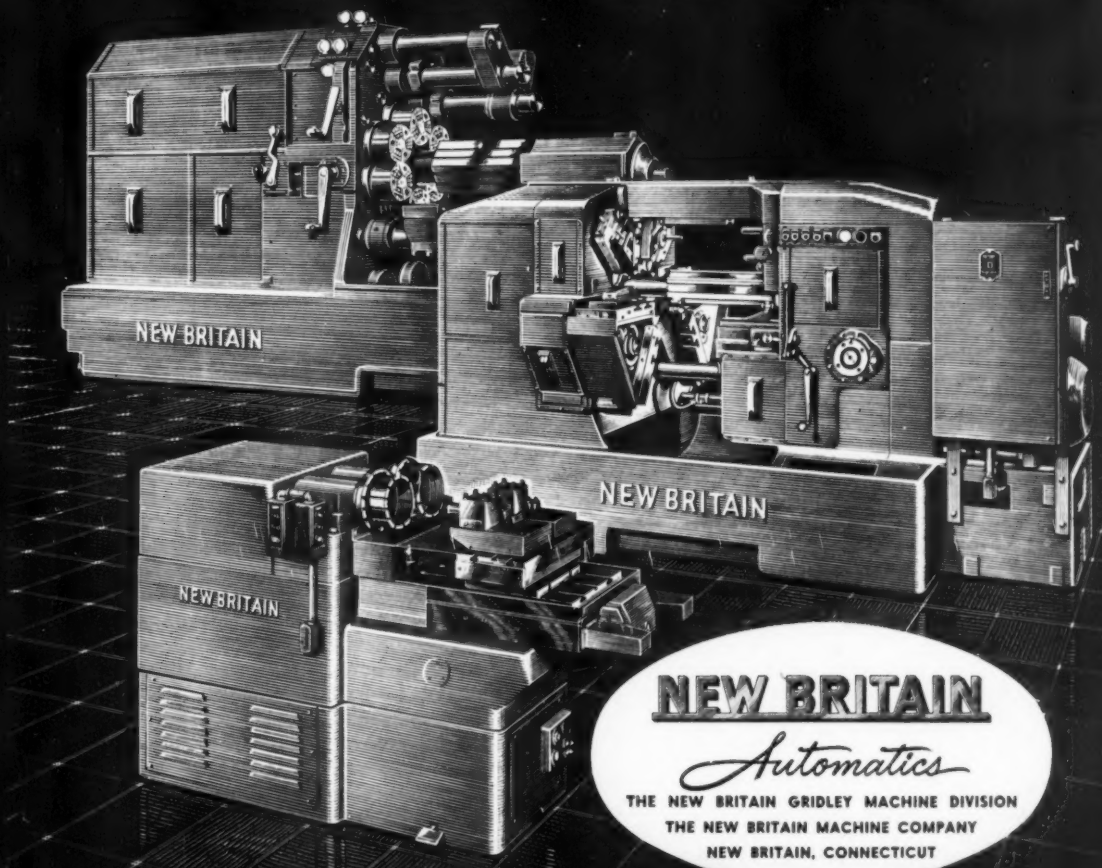
A general catalog on machines listed below is available on request.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Designed for making fast work of slow jobs

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES

LUCAS HORIZONTAL BORING DRILLING AND MILLING MACHINES



NEW BRITAIN

Automatics

THE NEW BRITAIN GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Typewriter mainspring redesigned

for volume production at lowest possible cost

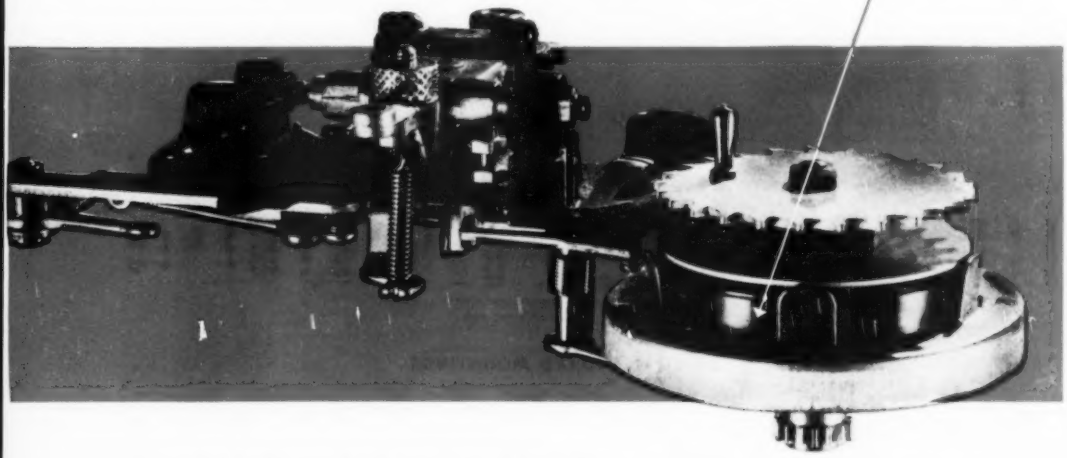
The American Quality Spring shown here is the absolute heart of a famous-make typewriter. It furnishes driving power for the entire typewriter—operates the drawbar, controls spacing between characters, drives the ribbon mechanism.

The spring is wound and unwound thousands of times every week, yet tension remains constant and breakage is almost unheard of.

To perfect the mechanical properties of the spring, our engineers worked hand in hand with the manufacturer's engineers. The design was altered to eliminate a weak spot that was responsible for breakage. This change was combined with others that made the spring easier to produce in quantity—at a lower cost.

There's only one way to get such improved spring performance at an even lower cost: let us work with you in the early stages of design. Our designers are real experts on the mechanics and metallurgy of spring design. We know just what our modern spring-making machinery will do—and therefore we can help you design a better spring that is easier to mass-produce, cheaper to buy.

This is the mainspring drum bracket group on the typewriter mentioned above. The American Quality Spring is in position, ready for years of trouble-free service.



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USS

AMERICAN QUALITY SPRINGS

UNITED STATES STEEL

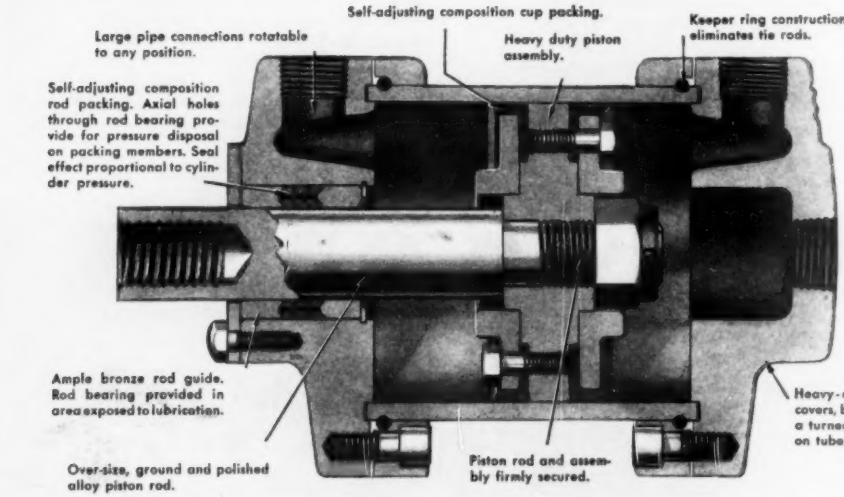
Avoid air power failure!

Choose Rivett Air Cylinders

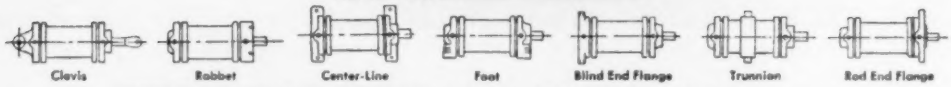
The importance of smooth, steady cylinder performance cannot be over-emphasized in today's production. Only too often a whole line is slowed down, or stopped altogether because of a faulty cylinder.

You can rely on Rivett air cylinders to provide dependable service. Study the construction features shown below. They represent many years of practical cylinder design — and are the basis on which thousands of satisfied customers have purchased Rivett.

Recommended for pressures up to 150 P.S.I., Rivett air cylinders are available in 7 standard mountings; in 9 bore diameters, in any length stroke up to 96", single or double-end rods, with internal or external thread, and cushioned rod end, blind end, or both. Special covers supplied. Send today for Catalog Section 55.


Self-adjusting composition cup packing.
Large pipe connections rotatable to any position.
Heavy duty piston assembly.
Keeper ring construction eliminates tie rods.
Self-adjusting composition rod packing. Axial holes through rod bearing provide for pressure disposal on packing members. Seal effect proportional to cylinder pressure.
Ample bronze rod guide. Rod bearing provided in area exposed to lubrication.
Over-size, ground and polished alloy piston rod.
Piston rod and assembly firmly secured.
Heavy-duty alloy covers, bored to fit a turned diameter on tube.

SEVEN STANDARD MOUNTINGS

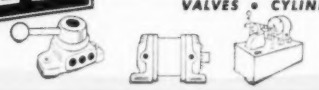


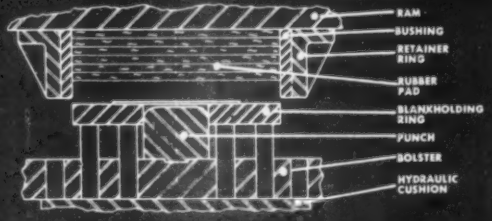
RIVETT LATHE & GRINDER, Inc. • Dept. AM-10, Brighton 35, Boston, Massachusetts

RIVETT furnishes a complete power package

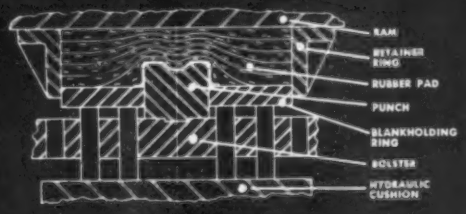
VALVES • CYLINDERS • POWER UNITS

Air and Hydraulic
All sizes and types



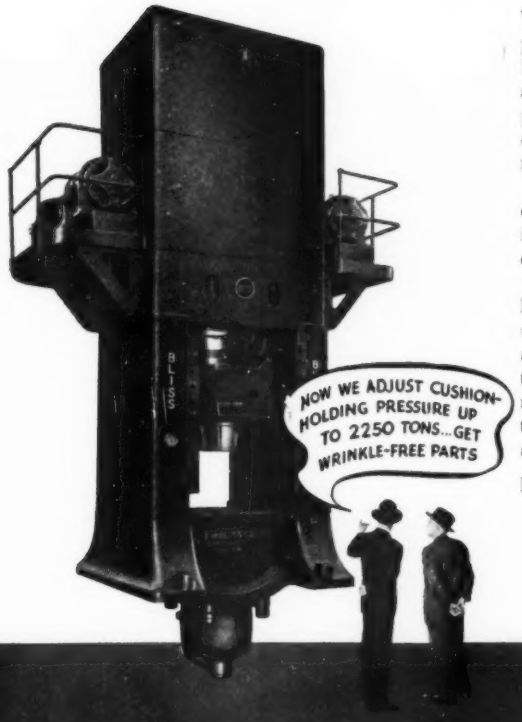


Rubber-pad draw die in open position on a single-action press with cushion: To provide higher pressure, pad area is decreased by inserting a bushing inside rubber retainer ring.



A double-action rubber-pad die in closed position: The high pressures, which rubber pad withstands, make possible production of reverse curves (like that at top of punch).

Deep, Complex, Wrinkle-free Shapes through Rubber-Pad Press Forming



You can now have short-run production of deep-drawn parts through rubber-pad forming—with substantial savings in tooling time and costs. Required heavy pressures are delivered by single and double-action hydraulic presses with a holding cushion in the bed and rubber pad on the slide. Compared with drop-hammer methods, the rubber-pad process offers a *better product at less cost.*

Airframe manufacturers, after experimenting with the double-action type of rubber die work, report pressures from 1500 psi to 4000 psi. In some instances pressures of 15,000 psi on the rubber itself are found desirable.

Highly versatile Bliss Hydraulic Presses with blank-holding cushions built into the bed and cushion capacities up to about ninety percent of the press rating, are available in a wide range of sizes. Flexible pressure controls to suit the work range are furnished. The rubber pad and retaining ring of suitable dimensions may be ordered with the press. Submit samples or part prints. Bulletin 39 gives a description of the process.

E. W. BLISS COMPANY, CANTON, OHIO

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

From the right press for a given job.....
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700-Page Handbook Tells How to Use Presses Efficiently

Bliss Power Press Handbook, 450 illustrations. Sections on: Easy methods of computing press jobs • How to select proper press • Engineering tables • Die illustrations • Glossary of terms. Plus service section on all Bliss presses. Price $7.50

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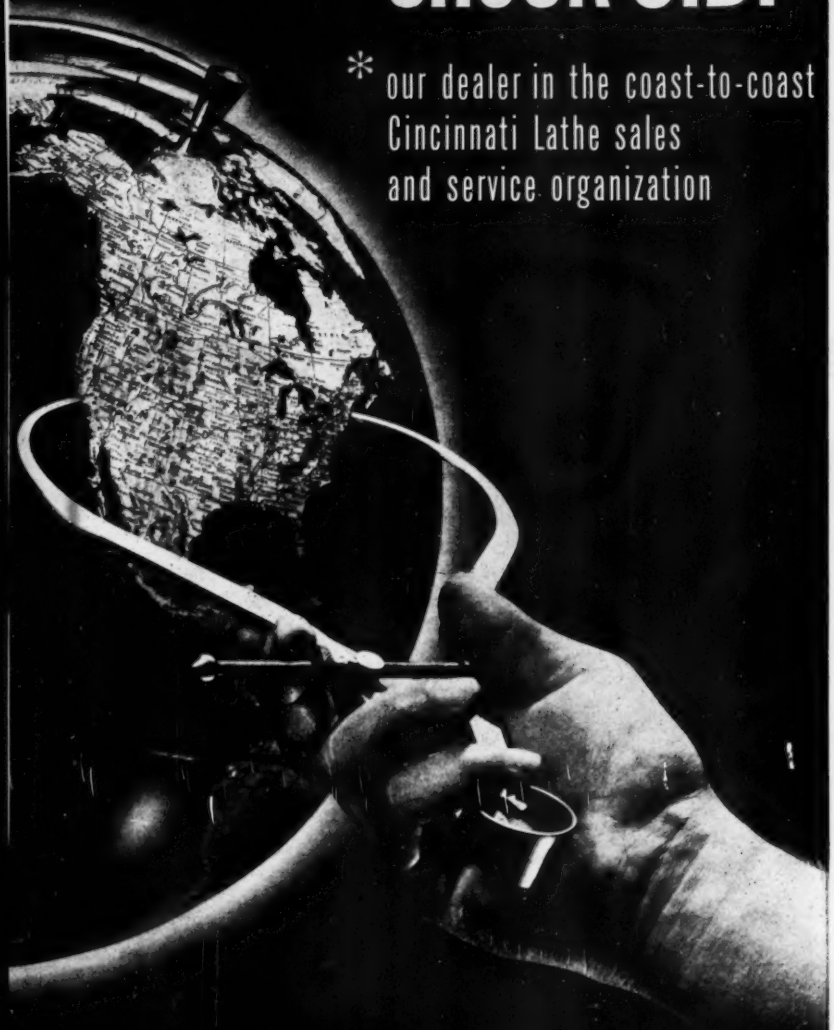

Our Dealers — conveniently at hand in almost every industrial center in the U.S. and Canada — are good men to know. They have been selected for their technical background and experience to provide **serviceability** on a par with the high-quality Engine, Tool Room and Gap Lathes which bear the Cintilathe trademark. Spot the dealer in your locality, and call on him for help in selecting the right size and type Cincinnati lathe and accessories. He's always **at your service.**

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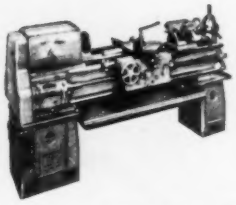
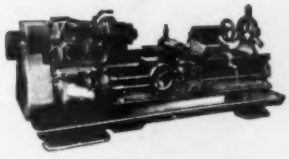
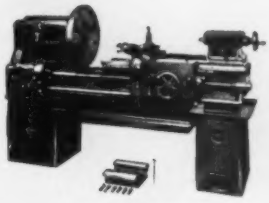


Tray-Top Engine and
Toolroom Cintilathes



Standard Engine Cintilathes
with and without Gap



Tray-Top Cintilathes
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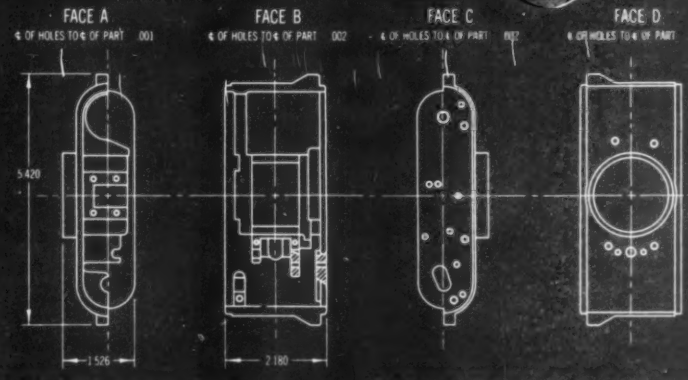
Snapshot of a Profitable Operation



PART: Plastic Camera Case

PRODUCTION: 250 parts per hour for the battery of NATCO A-33 Light Sensitive Multi-Drillers

OPERATIONS:

FACE A—Drill four holes to .070" diameter

FACE B—Drill two holes to .067" diameter and one hole to .0781" diameter

FACE C—Drill six holes to .0781" diameter, three holes to .089" diameter, one hole to .120" diameter, one hole to .082" diameter and one hole to .281" diameter

FACE D—Drill two holes to .070" diameter, two holes to .1465" diameter, two holes to .0781" diameter and one hole to .191" diameter

Battery of Natco A-33 Light-Sensitive Multi-Drillers

NOW...250 of these camera parts per hour are drilled on four faces with extreme accuracy...size of holes from .067" to .281"

When maintenance became too costly a camera manufacturer substituted this battery of NATCO A-33 Light Sensitive Multi-Drillers. An indication of the precision and production of these new NATCO's is evidenced in the following quotation from the camera manufacturer: "Despite the high degree of accuracy which is maintained, the production rate from the battery of NATCO's is approximately 250 units per hour." In terms of profitable operation this NATCO installation represents a big improvement for the manufacturer and is helping him to keep maintenance and production costs in line and product quality high. Let NATCO help you meet rising costs . . .

Call a Natco Field Engineer

to help you solve your problems in Drilling, Tapping, Boring & Facing

Golden Anniversary

1901 NATCO 1951

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

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With

A complete line of accessories.

A control number on every block.

Burr-proofed edges.

A compact case.

PERHAPS you have never investigated the enormous possibilities in Gage Blocks for controlling dimensional accuracy and reducing spoilage! Look over the page at the right! You have some or all of these problems.

A set of 83 DoALL Gage Blocks with accessories *will make over 120,000 different snap gages for about 1/4 cent each.* Any one of these gages are made quickly. Just fit the blocks together with the necessary holders and you are ready for any measuring job—checking finished work, jigs and fixtures or other working or inspectors' gages.

DoALL Gage Blocks are *accurate to millionths of an inch.* They are ready when you want them—there is no loss of time or waste of good tool steel as when making your own gages.

With a set of DoALL Gage Blocks and the DoALL Accessories you are fully equipped for absolute perfection in dimensional accuracy control. There is a full line of blocks in sets for every purpose in either Metric or English. You *can't buy* finer inspection equipment.

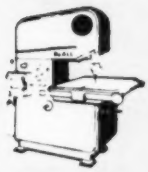
Ask for a demonstration of DoALL Gage Blocks in your plant. Your local DoALL Service Engineer will show them to you. Write or call!

THE DoALL COMPANY

254 N. Laurel Avenue • Des Plaines, Illinois

THIS BOOK will help you! MODERN MEASUREMENT CONTROL. Twenty pages describing DoALL Gage Blocks and accessories and how to use them. Ask, too, about DoALL Calibration Service for your present Gage Blocks. ➡

GB-4



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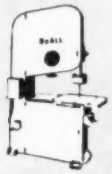

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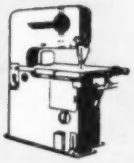

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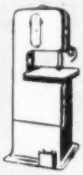


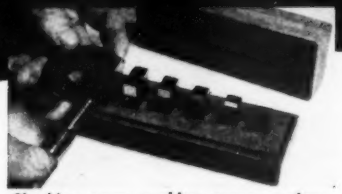
BAND FILER

TOOLROOM GRINDER

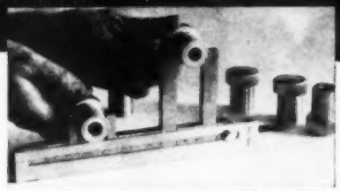
CRUSH GRINDER

DoALL *Gage Blocks*

1. You get measurements in millionths of an inch!
2. You can "build" a gage in a matter of minutes!
3. You cut no metal — waste no material!



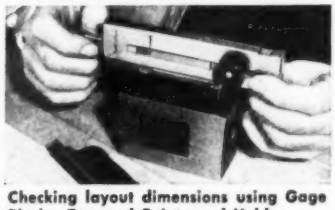
Checking your working gages — micrometers, calipers, snap gages, etc.



Go and no-go gages are quickly and inexpensively set up for checking parts.

Height Gages for checking heights and bore diameters.

Scriber Point scribes straight lines with absolute accuracy.



Checking layout dimensions using Gage Blocks, Trammel Points and Holder.

Gage Blocks, Comparator and Sine Bar being used to check bevel gear.

Checking machine settings and milling operations.

Checking fixed gages and snap gages with DoALL Gage Blocks.

Gage Blocks combined to check an adjustable snap gage.

Take time pieces for example . . .

Westclox	Benrus Watch Company	U. S. Time Corp.
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Hamilton Watch Co.	Minneapolis Honeywell Regulator Co.	International Business Machines Corp.
Gruen Watch Company		

These are producers of highest quality products whose basic manufacturing accuracy is controlled by DoALL Gage Blocks.

The list of DoALL Gage users is the roster of production achievement.

DoALL

Sales-Service Stores in All Principal Centers

BENCH FILER

CARBIDE TOOL GRINDER

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SAW BANDS

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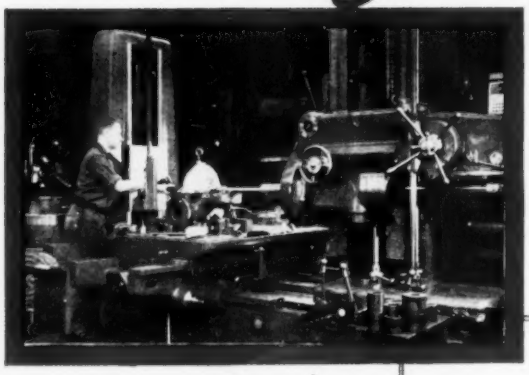
See us at the Metal Show Detroit, October 15-19. Booth H 305

Fine Machine Work

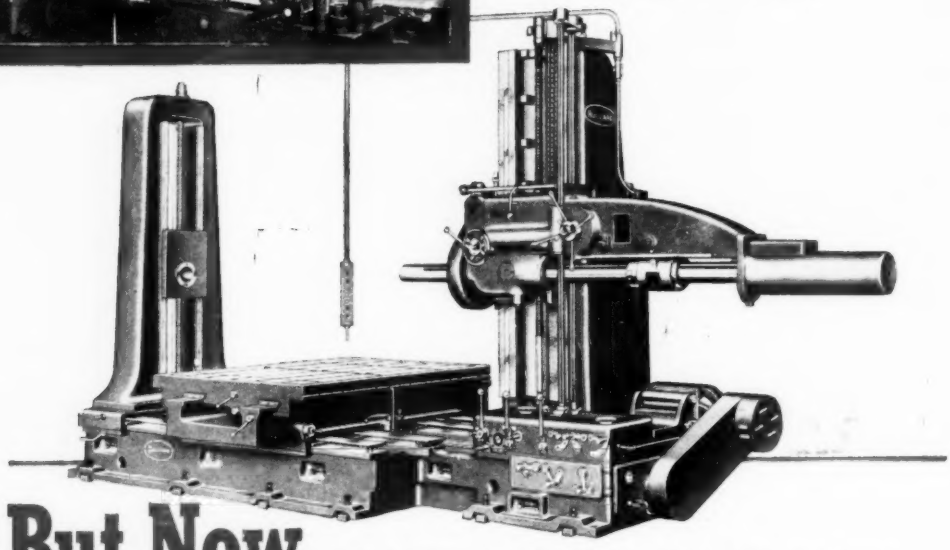
"Decides the Quality of a Pump"



. . says
Warren Steam Pump Co.
of Warren, Mass.

testimonial enough
for their five

Universal
Boring Machines



But Now... Universal Redesigned by Bullard offers a broad 4-way bed Horizontal Boring, Milling and Drilling machine with an even Higher Degree of Rigidity, Accuracy and Serviceability.

Call in a Bullard Engineer or write for complete details describing the many points of Redesign and Modernizing.

Bullardize your plant for Higher Efficiency.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

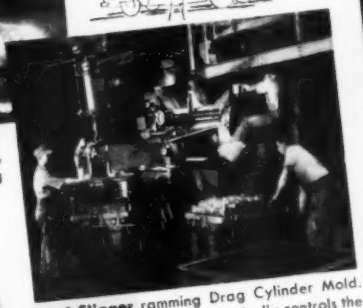
Square D Motor Control

SPEEDS SUPER-AUTOMATIC FOUNDRY PRODUCTION FOR STUDEBAKER . . .

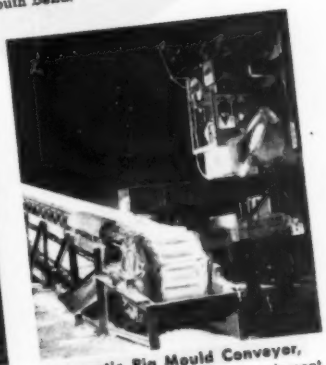
Square D Controlled Core Knockout Machine removes cores by vibration—also removes waste sand and dust.

Typical Square D Motor Control Panel installed in Studebaker's mechanized foundry at South Bend.

At this Iron Pouring Station, Square D devices control sand handling system, moulding conveyor line, dust collecting and iron pouring.



Sand Slinger ramming Drag Cylinder Mold. Square D equipment automatically controls the timing cycle for flask-filling operation.



Automatic Pig Mould Conveyor, controlled by Square D equipment.

Square D Remote Control Panel handles 38 different stations on automatic conveyor system from one centralized location.

STUDEBAKER has doubled its output of motor castings with this automatically-controlled foundry operation.

SQUARE D MOTOR CONTROL puts such automatic production lines through their paces in industrial plants of every kind and size. The completeness of Square D's line meets practically any AC or DC application requirement. Standardized components, each designed to perform a specific control function, are physically proportioned to make up compact, attractive panels. Complete accessibility facilitates speedy inspection and maintenance.

SQUARE D COMPANY

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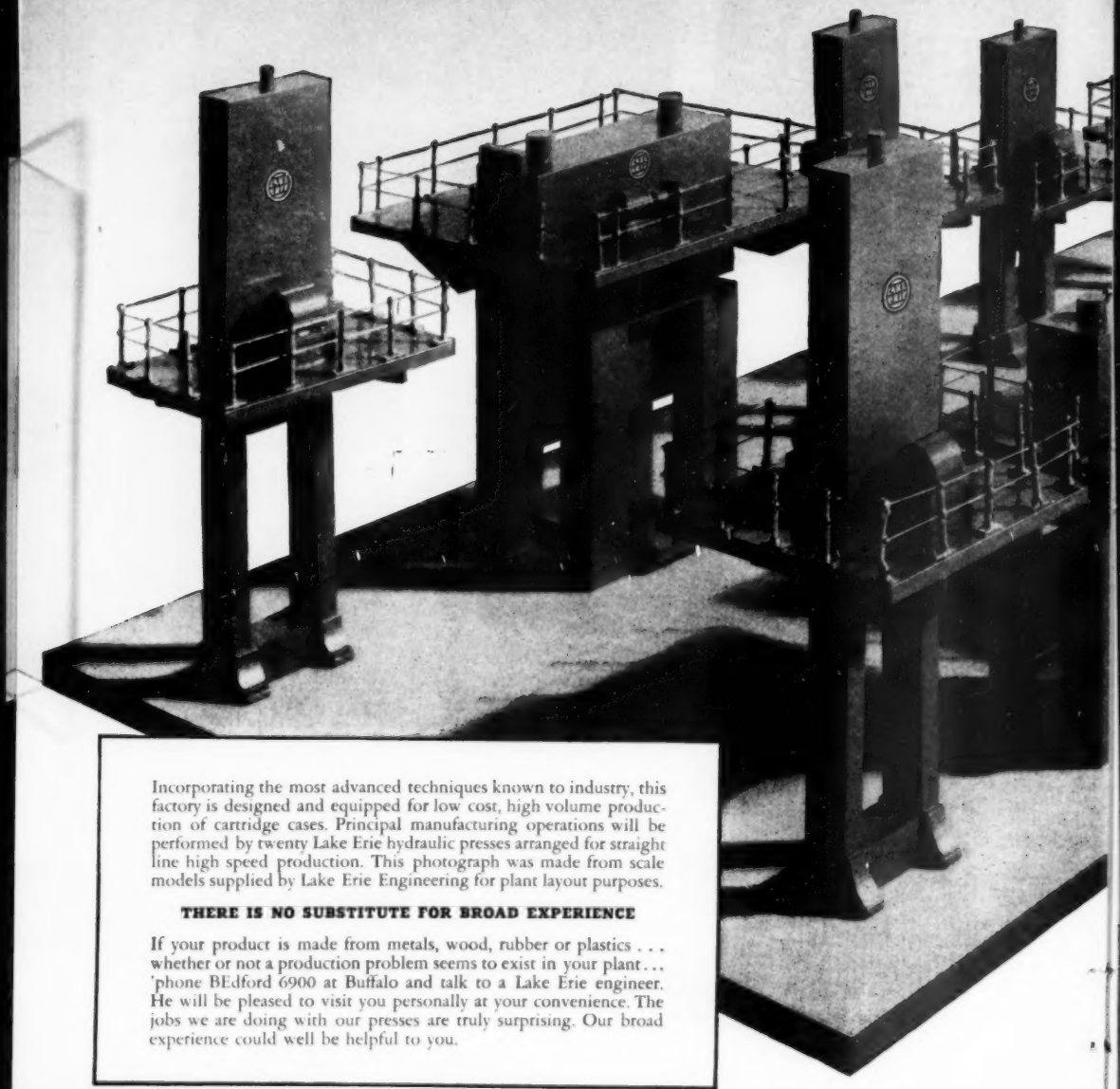
20 LAKE ERIE HYDRAULIC PRESSES

EXCLUSIVE EQUIPMENT FOR NATION'S NEWEST MUNITIONS PLANT



Incorporating the most advanced techniques known to industry, this factory is designed and equipped for low cost, high volume production of cartridge cases. Principal manufacturing operations will be performed by twenty Lake Erie hydraulic presses arranged for straight line high speed production. This photograph was made from scale models supplied by Lake Erie Engineering for plant layout purposes.

THERE IS NO SUBSTITUTE FOR BROAD EXPERIENCE

If your product is made from metals, wood, rubber or plastics . . . whether or not a production problem seems to exist in your plant . . . 'phone BEdford 6900 at Buffalo and talk to a Lake Erie engineer. He will be pleased to visit you personally at your convenience. The jobs we are doing with our presses are truly surprising. Our broad experience could well be helpful to you.

R LAKE ERIE

Rapid firing automatic weapons consume millions upon millions of cartridge cases. The short supply of brass plus manufacturing cost plus the need for earliest possible increased production combined to present our ordnance offices with a problem Lake Erie Engineering was well qualified to help solve.

Lake Erie had already pioneered the design and manufacture of hydraulic presses to both cold extrude and deep draw steel into closed end cylindrical shapes. In this instance, with the selection of steel as the cartridge case metal, Lake Erie's proven "know how" went on to work out press design, capacities and functions to give this plant smooth, low cost production flow in the specified volume.

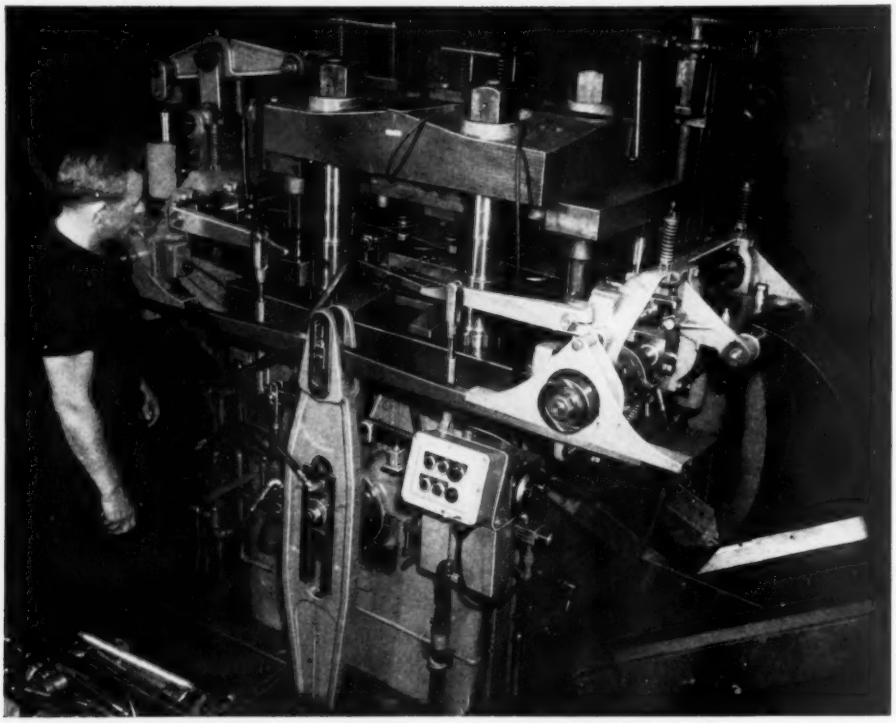
Twenty Lake Erie hydraulic presses ranging in capacities from 50 to 4,500 tons, will cup, pre-draw, deep draw, taper and head cartridge cases in required calibers.

By coming to Lake Erie, the press equipment to answer this production problem was taken care of at one source. A plus value in the dependable operation of this plant is simplified maintenance, because the hydraulic press equipment becomes standardized . . . exclusively Lake Erie.

LAKE ERIE ENGINEERING CORPORATION

General Offices and Plant: 507 Woodward Ave., Buffalo 17, New York

LAKE ERIE HYDRAULIC PRESSES are available in any size . . . standard, modified and special design — horizontal and vertical types — for Metal Working — Plastics Molding — Forging — Metal Extrusion — Processing — Vulcanizing — Laminating — Stereotype Molding — Die Casting — Briquetting — Baling — Special Purpose.



For The Oldberg Manufacturing Company*

which uses Henry & Wright Dieing Machines to produce muffler parts such as oval outerheads, oval innerheads, three-pass innerheads and cones. Oldberg, like other leading companies who know the score, rely on Henry & Wright Dieing Machines to slam a cover on rising production costs. These compact, precise, metal-fabricating wonder workers swing at costs with a two-fisted attack. And what a licking these costs take. They just can't stand up to the one-two combination of high speed and long die life delivered by Henry & Wright machines.

*Subsidiary of The AP Parts Corporation, Toledo, Ohio, manufacturers of: Mufflers, Pipes, Miracle Power, DGF 123.

Only the best is

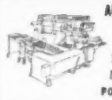
OTHER EMHART PRODUCTS INCLUDE:

GLASS MAKING MACHINES

HARTFORD-EMPIRE CO.

Division of Emhart Mfg. Co.

HARTFORD 2, CONNECTICUT



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Division of Emhart Mfg. Co.

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PLASTIC BOTTLES, RODS, TUBES, SPECIAL SHAPES

PLAX CORPORATION

Subsidiary of Emhart Mfg. Co.

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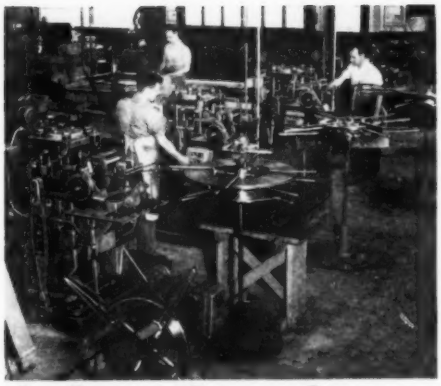
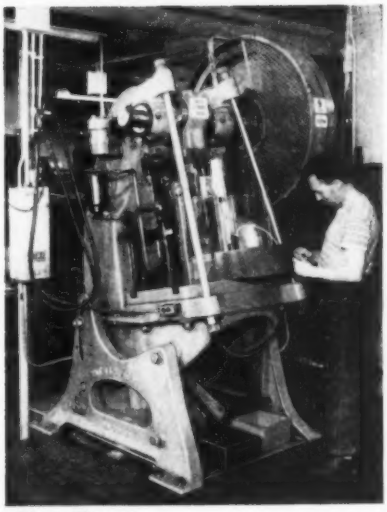


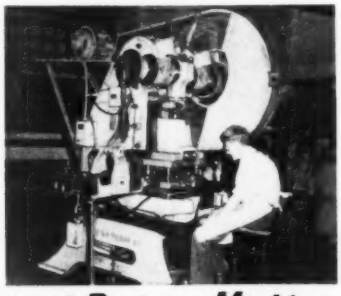
For Barber-Colman Company

where Henry & Wright Dieing Machines are "an important contributor to the production of many of our products, particularly our Uni-flo Air Distribution Outlets." Above 25-ton units are piercing, folding and cutting off strips of grill material to predetermined lengths.



For Gillette

where 10-, 25-, and 50-ton V & O presses are used. Above 50-ton machine forms the cap for the Gillette one-piece razor at production rates of approximately 4,000 parts per hour. Engineered for close tolerance work, V & O presses are preferred by companies making precision-built products.



For International Business Machines

which uses V & O presses for numerous precision parts. The above V & O press is producing an armature for relay assembly out of coiled, cold-rolled electrical iron. Five working stations are used. The part is trimmed, pierced with two holes, finish blanked, and offset at one end. In the final working position, two ears are bent up and a second offset is formed.

H&W

HENRY & WRIGHT
DIVISION OF EMHART MFG. CO.

good enough

FACT PACKED CATALOGS

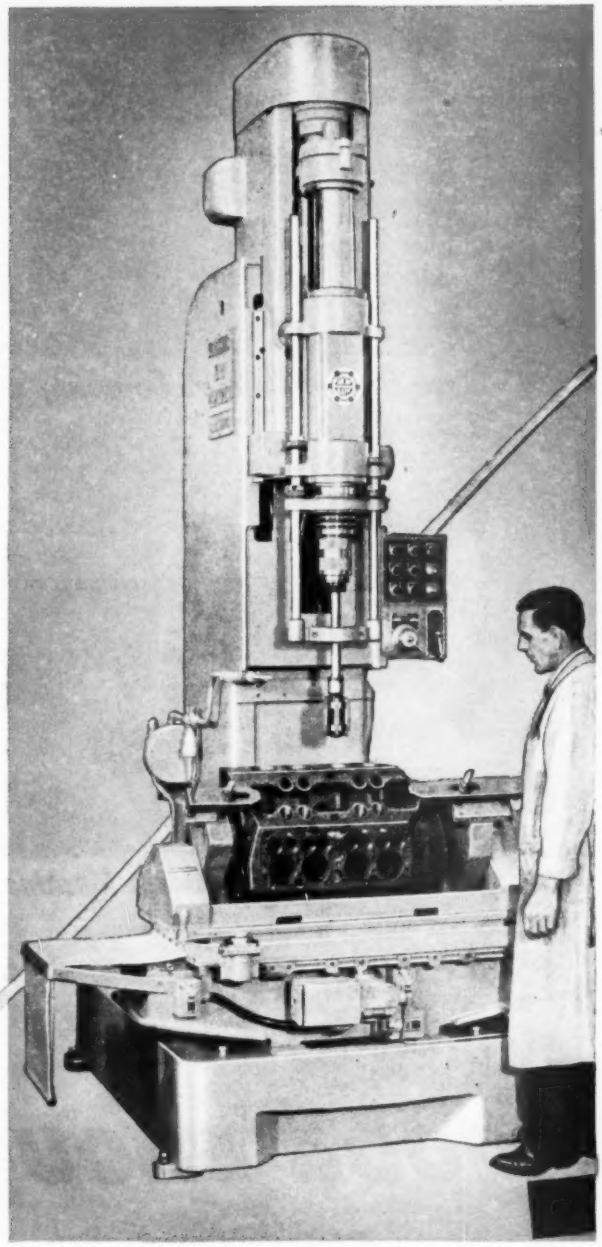
Catalogs containing complete specifications and operating details are available. Please write The V & O Press Company, Hudson, N. Y.

Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 483 Windsor St., Hartford, Conn.

V & O

THE V & O PRESS CO.
DIVISION OF EMHART MFG. CO.

Want Smoother, Cooler Honing?



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For lubrication counsel, get in touch with your nearest Supplier of Sinclair Products

Sinclair HONOL efficiently carries off heat and swarf... helps produce a finer finish

What coolant will best get rid of heat, to prevent discoloration, distortion? What fluid will best carry off chips and swarf, to avoid filling up of abrading sticks, glazing, scoring, scratching?

Sinclair specialists designed HONOL to solve these exacting requirements. And users report highly satisfactory results with this fine, ready-mixed honing fluid.

If you want greater accuracy and fineness of finish — join the others who are profiting with Sinclair HONOL. It is available in several grades, all ready for use.

Promotes Effective Stock Removal

Decreases Stone Wear

Carries Away Heat

COOLANTS...for metal working

or write direct to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

to turn a production problem into a LIGHT *subject—*

make it of

BRASS

These eighteen copper alloy parts, illustrated approximately half-size, go into the military flashlight produced by The Niagara Searchlight Corporation of Buffalo, N. Y. Only copper alloys can provide the complete range of physical properties needed and still maintain low manufacturing cost.

If, like this military flashlight, your product consists of parts calling for certain physical properties . . . if it must be born of a streamlined manufacturing budget and still be an aristocrat in quality—then you'll find no metal more versatile than brass.

Although almost all of these 18 metal parts differ in their function, copper alloys supply the required properties — high electrical conductivity, resilience, excellence as a plating base, strength, immunity to rust and resistance to corrosion. And to all these properties, singly or in combination, add the characteristic that brass can be fabricated more economically by more methods than any other metal.

With all these properties, brass has no equal for its usefulness as a manufacturing metal. Brass is the metal on which your designers, cost analysts, production men and sales department will be most likely to agree.

Our Technical Department will gladly suggest the copper alloy best suited to your product and manufacturing methods. Just write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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ANACONDA® *the name to remember in* **COPPER BRASS BRONZE**

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1 Choose a line that is complete... for all types of applications

2 Be sure there are Field Men available to help you select the right tools and use them right

3 Insist on 100% inspection... each reamer inspected individually

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TESTING HARDNESS of finished tools on a Rockwell Hardness Testing Machine.

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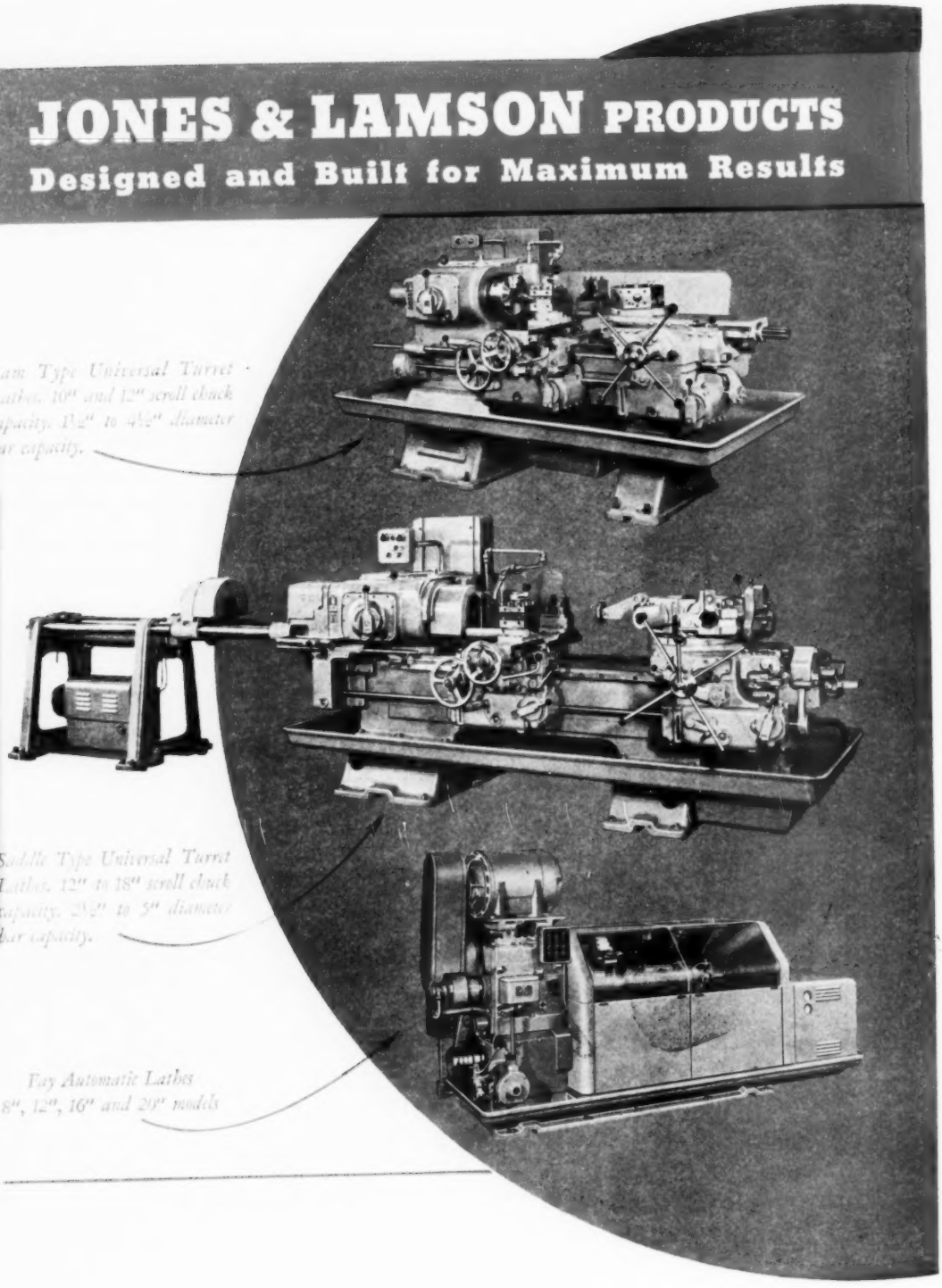
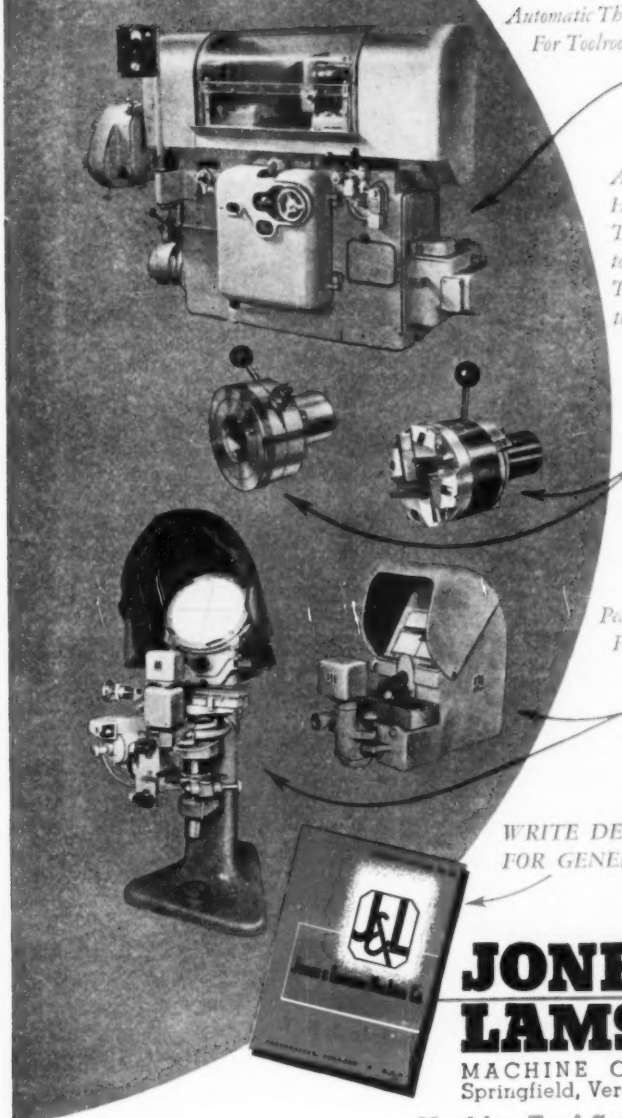


Ram Type Universal Turret Lathes, 10" and 12" scroll chuck capacity. 1⅛" to 4½" diameter bar capacity.

Saddle Type Universal Turret Lathes, 12" to 18" scroll chuck capacity. 2⅝" to 5" diameter bar capacity.

Fay Automatic Lathes 8", 12", 16" and 20" models

Ask the J&L expert in your neighborhood to explain the cost-reducing developments in new J&L equipment — *also, how you can obtain even better results from your* PRESENT J&L equipment



Automatic Thread and Form Grinders For Toolroom or Production Line

Automatic Opening Die Heads. Radial Chaser Types — Capacities No. 8 to 4¼". Tangent Chaser Types — Capacities No. 4 to 2".

Optical Comparators, Pedestal and Bench Models. For Toolroom, Production Line and Laboratory

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Machine Tool Craftsmen Since 1835

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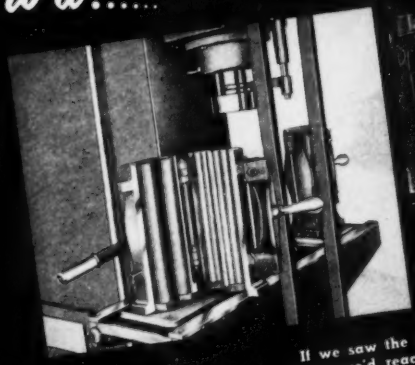
This ad....

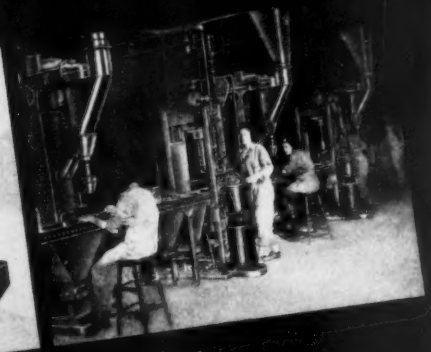
Help Wanted

COMPANY to design and build shell loading hydraulic presses. Must be fast, efficient and engineered for safety. World War II experience preferred.

DESIGN... tool designers, draftsmen. ...established manufacturer...

FITS KRW
to a.....



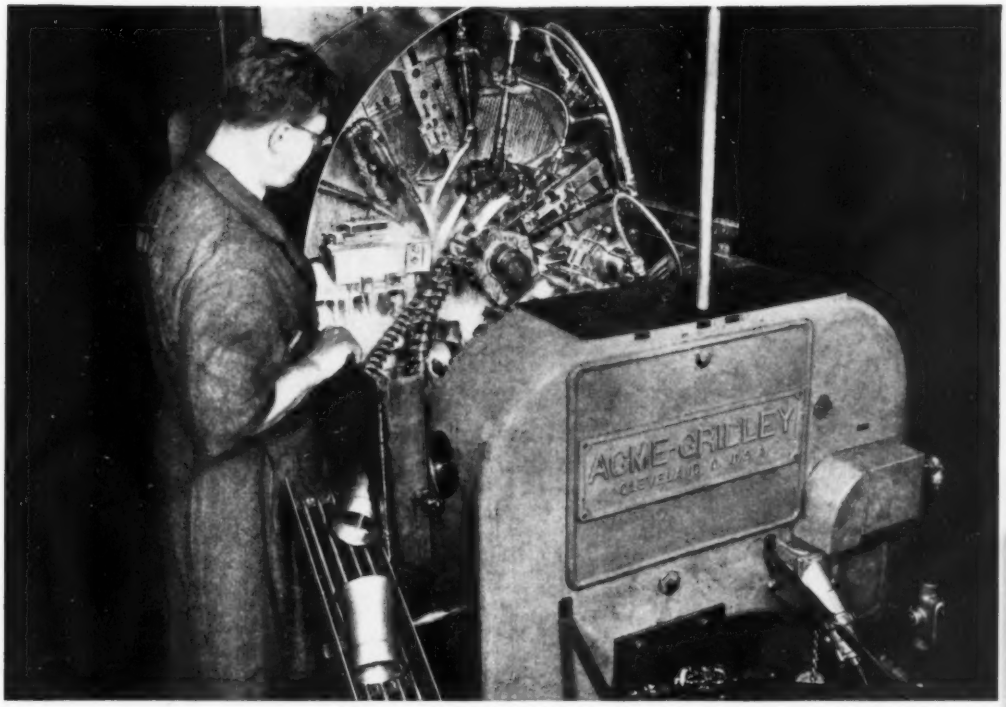


If we saw the above ad in tonight's paper, we'd reach for the phone . . . quick! The job's made to order for K. R. Wilson. During World War II, KRW engineers designed a faster and safer method for loading shells and incendiary bombs. Hundreds of KRW 1-station, 2-station and 4-station shell loading presses were supplied to bomb loading contractors across the country. The photo at left above shows a close-up of the shell case holder on a KRW 4-station shell loader. At right is a battery of KRW presses working at top speed in one of the nation's largest arsenals.

K. R. Wilson is set to do an even bigger job today. Almost two million dollars in new machinery and equipment have been added to our plant since World War II. So if you have shell-loading contracts, write, wire or phone KRW for the right equipment. We can go to work on your order at a moment's notice.

Send for
FREE NEW BOOKLET
It tells all about our plant, equipment, facilities and experience in war and peacetime production. It's yours for the asking. Write Dept. H.

K R WILSON
215 Main St. • Buffalo 3, N. Y.



FOR MORE PRODUCTION (and PROFIT) ON MUNITIONS PARTS

We can help you cut machining costs on munitions parts.

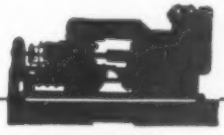
National Acme engineers have worked out standardized tooling and production methods for many of them, taking advantage of the faster setup and machining times possible on the versatile, new Acme-Gridley Model M Single Spindle Automatic. That way, you're ready to go right into production with no educational orders, trial setups or experimental tooling.

So you start out with a saving—and you'll save through the heavier feeds, faster speeds and closer tolerances you get on a Model M. You can have the advantage of faster production through fully automatic operation on a broad variety of parts and lot sizes. On the job illustrated, for example, machining time was cut 50%, using exceptionally heavy feeds and faster speeds.

Interested? Let us show you how the Model M can raise production—and profits—in *your* plant.

JOB FACTS

PART:	Collet Blank
MATERIAL:	A-4160 Steel
MACHINE:	$4\frac{3}{4}$" Acme-Gridley Model M Single Spindle Automatic
OPERATIONS:	14, including heavy drilling, light forming and turn and finish bore.
TOOLS:	Carbide and High Speed Steel
TIME:	17 Minutes
SAVING:	Machining time cut 50%



ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 1, 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

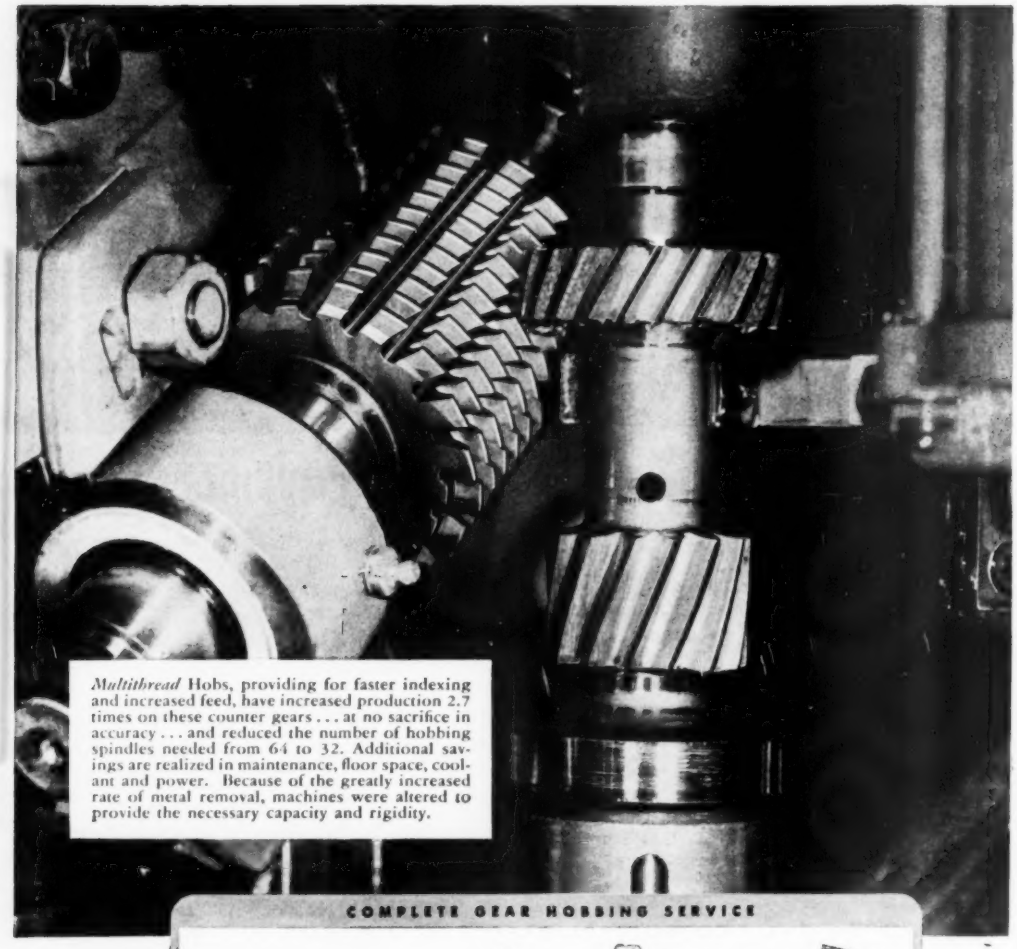
THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Barber-Colman

Multithread Hobs

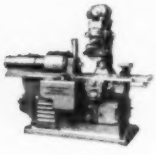
TRIM GEAR CUTTING COSTS

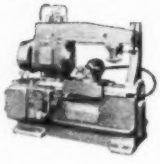


Multithread Hobs, providing for faster indexing and increased feed, have increased production 2.7 times on these counter gears . . . at no sacrifice in accuracy . . . and reduced the number of hobbing spindles needed from 64 to 32. Additional savings are realized in maintenance, floor space, coolant and power. Because of the greatly increased rate of metal removal, machines were altered to provide the necessary capacity and rigidity.

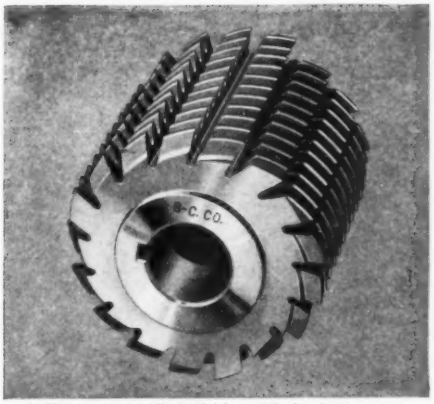
COMPLETE GEAR HOBBING SERVICE

BARBER COLMAN ®

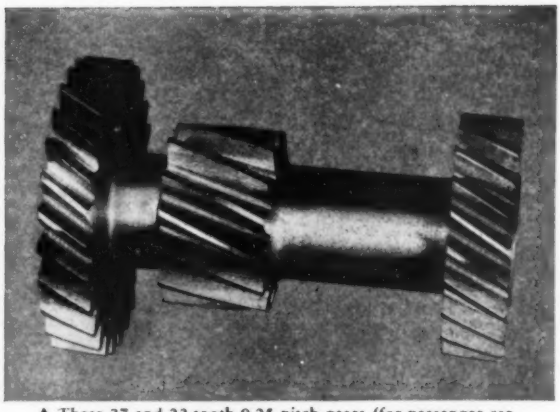




HOBS • MACHINES • SHARPENING • TECHNICAL DATA



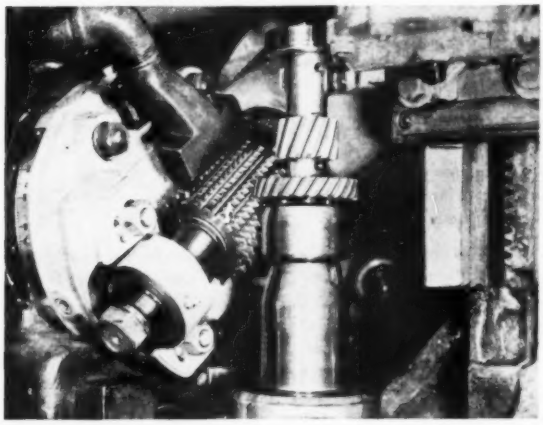
▲ These 4" x 4" *Multithread* hobs have more gashes for finer finish. A taper hole eliminates runout, holding the pitch line of the cut gears to maximum concentricity. Precision spacing of 3 leads produces involute and tooth spacing to preshave limits.



▲ These 27 and 22-tooth 9.25 pitch gears (for passenger car and truck transmissions) are forged from AISI 5145 or 8620-H steel. *Multithread* hobs have cut costs per gear to slightly over 1/3 former average. Lead errors are held within .0005". Production per hour has been increased from 26 to 82 gears (net, at 85% efficiency).

Automotive Plant Pioneers New Hob Application with Barber-Colman Hob Engineers. Disregards Conventional Hob Design to Almost Triple Production. Cuts Costs to ⅓ Previous Average.

▼ The 27-tooth gear on the counter gear is hobbed at 156 rpm and .062" feed. Previous feed was .053". Face width is 5/8". Cutting time per gear has been reduced from 6.55 to 2.2 minutes. Remarkable savings are possible because of increased feed and faster indexing with *Multithreads*.



The 22-tooth gear on the counter gear is hobbed at 156 rpm and .052" feed. Cutting time is 2.16 minutes. Single-thread ground hobs formerly cut at .043" feed. Hobbing time averaged 6.13 ◄ minutes per gear.

Multithread Hobs are a development by Barber-Colman engineers, providing faster indexing in the hobbing of gears. Instead of the usual single lead, *Multithreads* have several threads, and have produced unusual production increases on gear cutting jobs requiring very high rates of output.

As a result of production gains possible with hobs of this design, a fewer number of hobbing machines are required to complement the finish shaving and grinding equipment.

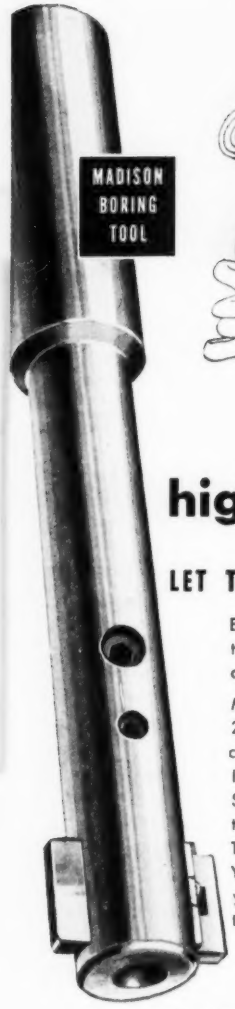
Multithreads are recommended only on the basis of comprehensive analysis of the job factors in individual plants. Therefore, we suggest that you ask a Barber-Colman Representative to call.

Write for additional information about the production increases possible with *Multithread* Hobs.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 3110 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF PRECISION GEAR HOBS AND MACHINES SINCE 1911



high boring costs make you blue?

LET THE MAN WITH HOLES IN HIS HEAD LOWER THEM FOR YOU

Every Madison cutter, and bar, no matter what its size, is designed to do your boring operations faster at lower cost. With Madison cutters and bars you never get those high-boring-cost-blues.

Madison cutters range in diameter from 5/8" to any desired size. Madison bars range from 2 1/2" to fourteen feet in length . . . or longer. The secret of Madison's ability to cut costs is Madison's exclusive cutter and bar design. First, there is Madison's two bladed cutter. It provides generous chip clearance . . . permits faster cutting without overheating. Second, is Madison's exclusive float design. Cutters float in Madison bars, special floating tool holders are never needed . . . both edges of the cutter take an equal bite. That means more holes per cutter, longer cutter life with fewer regrinds. You get these features, plus many other Madison advantages, when you ask the "Men With Holes in Their Heads" to cut your boring costs. Write today. A brief letter will do.

Write for the information filled Madison catalog: It is yours for the asking.

Tools for rough boring; finish boring; combination rough and finish boring, multiple cutting, bottoming; and other special tools.

MADISON MANUFACTURING CO.

DEPT. AM **MUSKEGON, MICHIGAN**

Buy the right HYSTER® 20 to fit your particular job

The *right* Hyster 20 lift truck, with the *right attachments, tools* and *accessories*, becomes the greatest cost cutting machine in the entire field of materials handling equipment.

6 variations of one basic model...select the one that best suits your needs

What lifting and transporting capacity do you require from a lift truck? In the HYSTER 20 you can have a model with—

1) **2000 lbs.** capacity at 15" load centers (Standard Hyster 20)
2) **2000 lbs.** capacity at 24" load centers (Optional additional counterweight added to Standard 20)
3) **1300 lbs.** capacity at 15" load centers (Skeleton counterweight)
4) **1000 lbs.** capacity at 24" load centers (Skeleton counterweight)
5) **2000 lbs.** capacity at 15" load centers (Skeleton counterweight plus optional additional ccounterweight)
6) **1500 lbs.** capacity at 24" load centers (Skeleton counterweight plus optional additional counterweight)

Where the transporting of 2000 lbs. on 24" load centers is a prime requirement, the installation of the additional optional counterweight to the standard 20 model achieves the necessary result.

The Hyster 20 with skeleton counterweight is of great importance where floor load limits exist; where elevator lifting capacities are materials handling factors; and where a high percentage of the loads are in the 1000 lb. range.

By quickly installing the additional optional counterweight to this same Hyster 20 with skeleton counterweight, lifting capacities are increased from 1300 lbs. to 2000 lbs. at 15" load centers; and increased from 1000 lbs. to 1500 lbs. at 24" load centers. This gives the owner a 2 in 1 lift truck combination.

Why carry around extra weight?

The Hyster 20 for 1300 lbs. at 15" load centers or 1000 lbs. at 24" load centers has a skeleton counterweight that reduces the weight of the standard Model 20 by 600 lbs. This light weight but heavy duty fork lift truck will cut maintenance and operating costs; yet it will provide the maximum lifting and transporting capacities required in a great many industries.

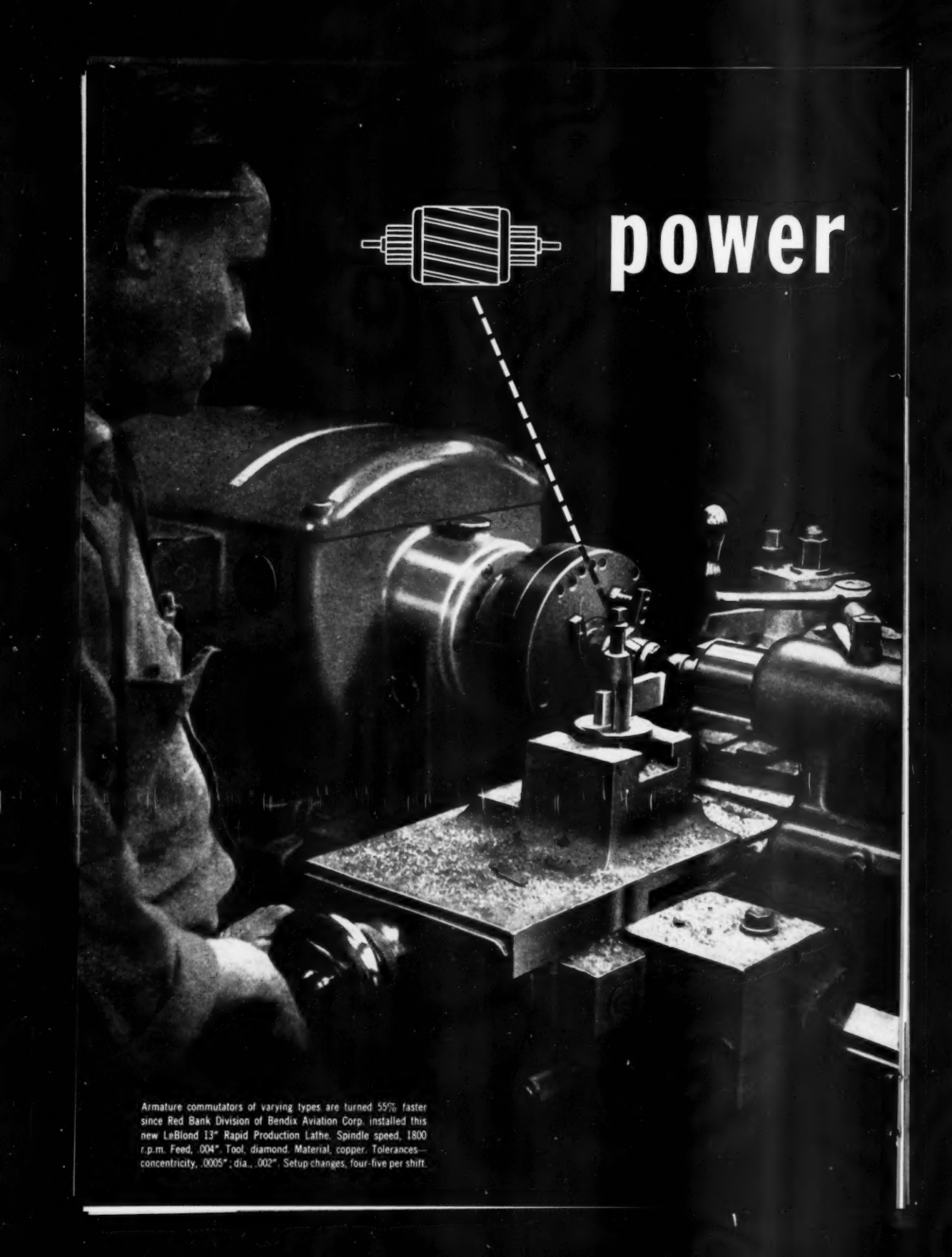
The additional optional counterweights can be installed in less than 30 minutes; removed in much less time.

See your Hyster dealer for further information.

HYSTER COMPANY

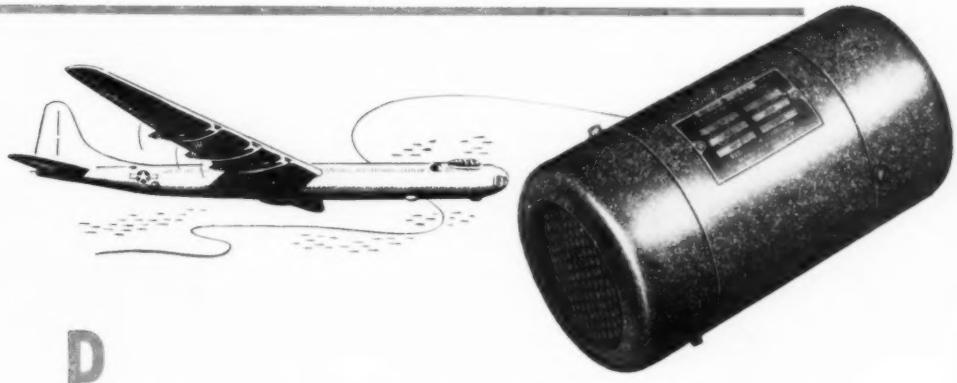
THREE FACTORIES

2902-14 N. E. CLACKAMAS ST., PORTLAND 8, OREGON
1802-14 NORTH ADAMS ST. . . . PEORIA 1, ILLINOIS
1010-14 MEYERS ST. . . . . DANVILLE, ILLINOIS



Armature commutators of varying types are turned 55% faster since Red Bank Division of Bendix Aviation Corp. installed this new LeBlond 13" Rapid Production Lathe. Spindle speed, 1800 r.p.m. Feed, .004". Tool, diamond. Material, copper. Tolerances—concentricity, .0005"; dia., .002". Setup changes, four-five per shift.

for an airplane's eyes and ears



Power for vital radar and communications equipment in airplanes is supplied by dynamotors like this. They're made in dozens of types and sizes to provide precise, unfailing power for the variety of electronic accessories used in modern aircraft.

Heart of the dynamotor is the armature. Its commutators require turning to high degrees of finish and accuracy for dependability under all flight conditions. For this job Red Bank Division of Bendix Aviation Corp. needed a precision production lathe, versatile enough to handle the entire range of sizes without costly setups. They installed a new LeBlond 13" Rapid Production Lathe . . . recommended by the LeBlond New York Office. Result? *Production increased 55%.*

This LeBlond Lathe makes possible high-production turning of a *variety* of work within the range *you* choose. It offers your choice of two geared and one motor headstock with various speed combinations from 68 to 3600 r.p.m., feeds from .001" to .064". A score of attachments is available.

Whether you turn tiny armatures or ten-ton shafts, there's a LeBlond Lathe to turn them faster, better. Your nearby LeBlond Distributor will tell you about the 13" Rapid Production and other late models. Call him or write . . .

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin RP-201 A for more information on the 13" Rapid Production Lathe.

turned faster by

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 63 YEARS*

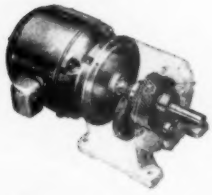
Get the one speed reducer that best fits your job

LINK-BELT builds all three types of enclosed gear drives

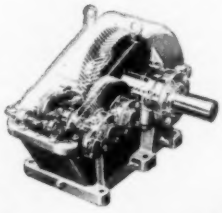
NO ONE speed reducer solves *every* reduction problem. That's why Link-Belt builds all three — Worm, Helical and Herringbone Gear Drives. Your Link-Belt power transmission engineer will recommend the *right* reducer for your needs.

You can be sure you get the one that suits all your requirements for ratio, space, shaft position, shock loading and many other factors. Precision-engineered for quiet, economical power transmission, all Link-Belt drives will give you long service under the toughest operating conditions.

On Worm Gear Drives, write for Book 2324-A



On Gearmotor and Helical Gear Drives, write for Book 2247

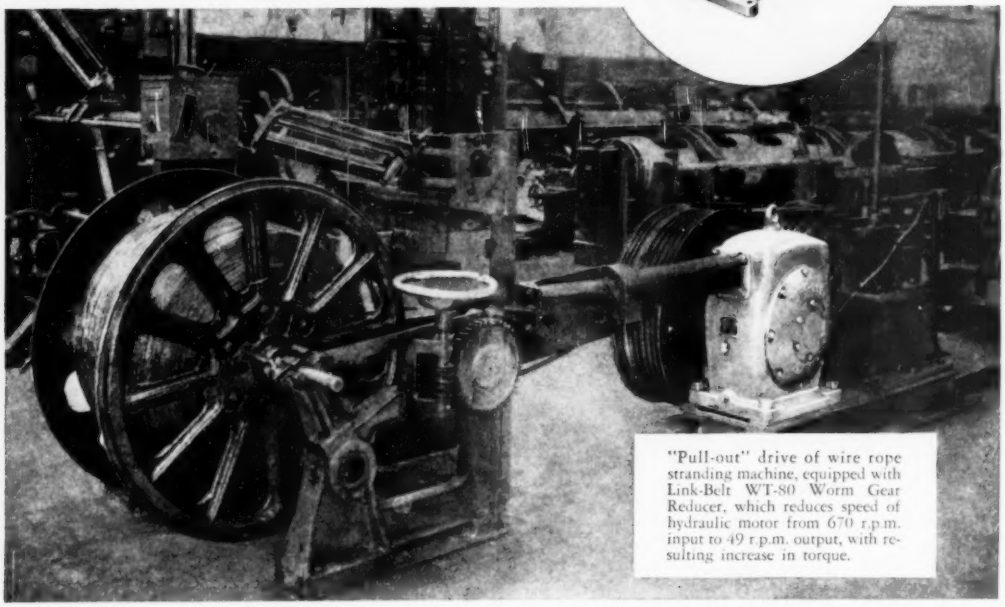


On Herringbone Gear Drives, write for Book 2419

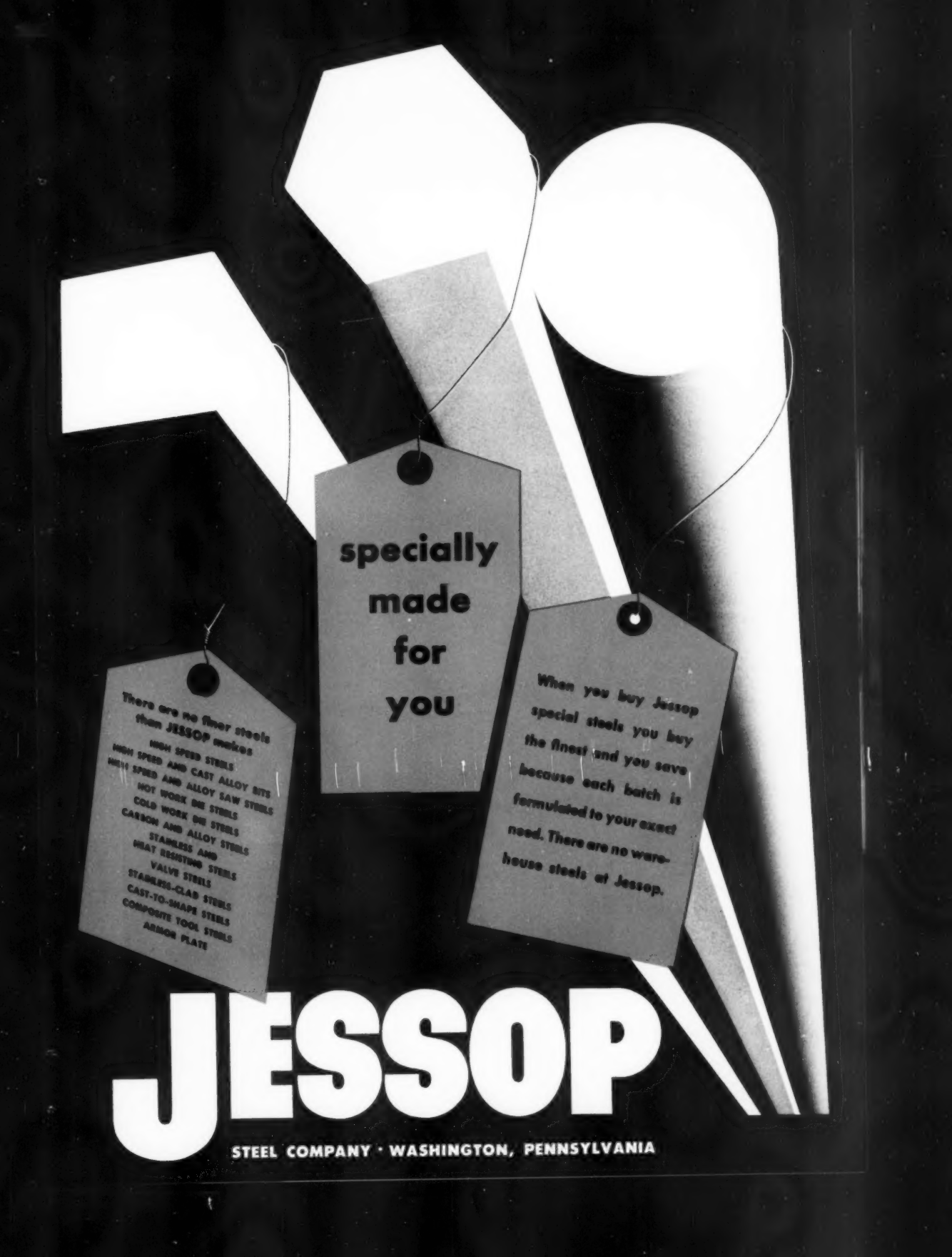
LINK-BELT

ENCLOSED GEAR DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12,416-A



"Pull-out" drive of wire rope stranding machine, equipped with Link-Belt WT-80 Worm Gear Reducer, which reduces speed of hydraulic motor from 670 r.p.m. input to 49 r.p.m. output, with resulting increase in torque.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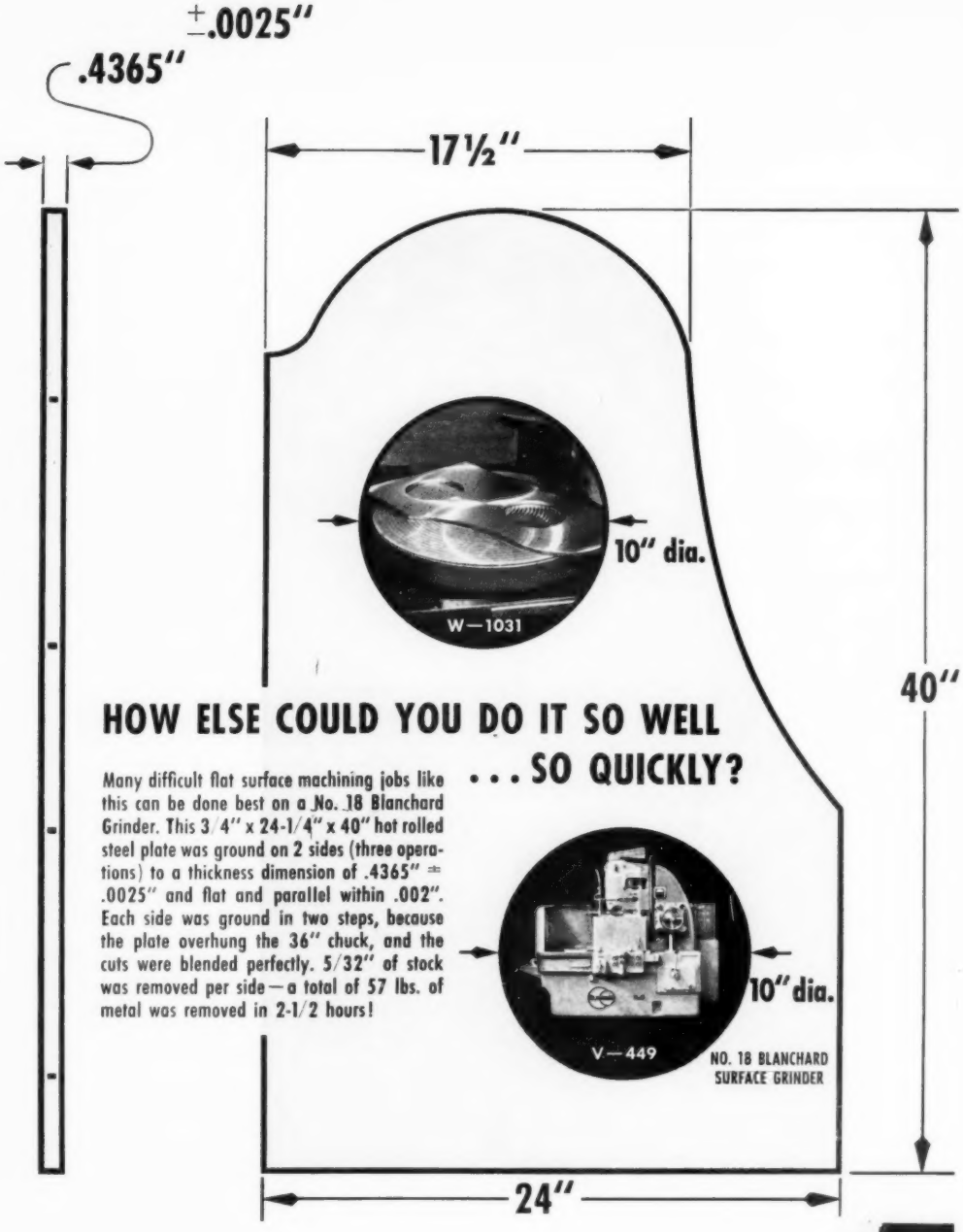

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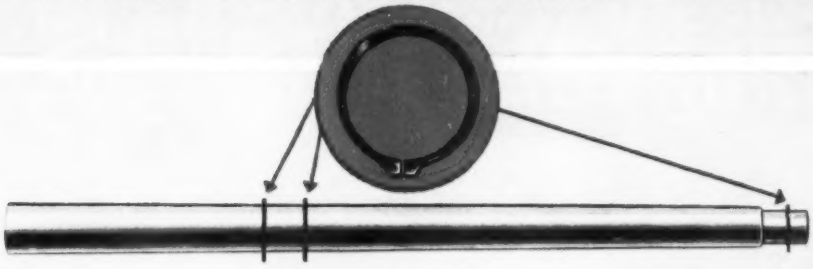
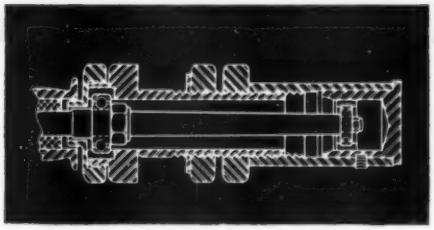
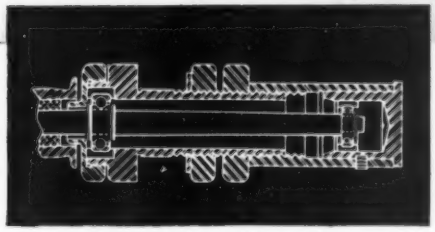
3 TRUARC RETAINING RINGS LOWER COST... IMPROVE PERFORMANCE OF REVOLUTIONARY NEW TEXTILE SPINDLE!





OLD CONSTRUCTION. To position 2 ball bearings, an oversize diameter rod had to be turned on a lathe to provide 3 shoulders. In addition, blade required 2 threading operations . . . 2 lock nuts . . . separate tapering operation. Proper pressure of nuts against ball bearings required skilled labor adjustment.



NEW CONSTRUCTION. Standard rod, equal in diameter to finished blade is used. Three grooves for Truarc Rings and shoulder are made quickly and easily on screw machine. Blade is economically tapered by centerless grinding. Truarc Rings maintain correct pressure on ball bearings for life of unit!

The H & B American Machine Company's new anti-friction CENTURY spindle is probably the most mechanically advanced spindle on the market today. Waldes Truarc Retaining Rings have eliminated many of the material, tooling and assembly costs...have kept its price competitive. Truarc Rings not only simplify spindle assembly, they position ball bearings accurately...simplify maintenance...eliminate skilled labor...improve performance! And there are Truarc Rings to solve any design or re-design problem!

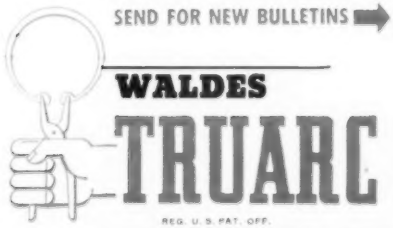
Redesign with Truarc Rings and you too will cut costs.

Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better job of holding parts together.

Truarc Rings are precision-engineered...quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

Waldes Truarc Retaining Rings are available for immediate delivery from stock, from leading ball bearing distributors throughout the country.



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WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,362,947 2,362,948 2,416,852 2,420,021 2,429,741 2,438,765 2,441,846 2,455,165; 2,463,380 2,468,363 2,481,502 2,487,805 2,491,506 2,508,081 AND OTHER PATENTS PENDING.

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send engineering specifications and data on Waldes Truarc Retaining Ring types checked below.

- ☐ Bulletin #5 Self-locking ring types
- ☐ Bulletin #6 Ring types for taking up end-play
- ☐ Bulletin #7 Ring types for radial assembly
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AM-103

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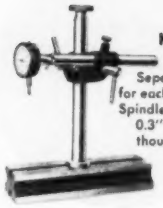
On-The-Job Accuracy Checks that Hold Production High

No. 730
Tubular upright and lever-style clamps. Spindle movement 0.3" by half-thousandths



No. 731
Separate clamps for each movement. Spindle movement 0.3" by half-thousandths.

No. 744
With permanent magnet base. Spindle movement 0.3" by half-thousandths

Brown & Sharpe Dial Test Indicators are an important aid to machinists in maintaining consistent accuracy at today's high production rates.

With minimum disturbance of work or loss of time, they provide quick, easy accuracy checks for flatness, concentricity, run-out, or innumerable other relationships. Especially valuable to set-up men, machine erectors, inspectors, or toolmakers.

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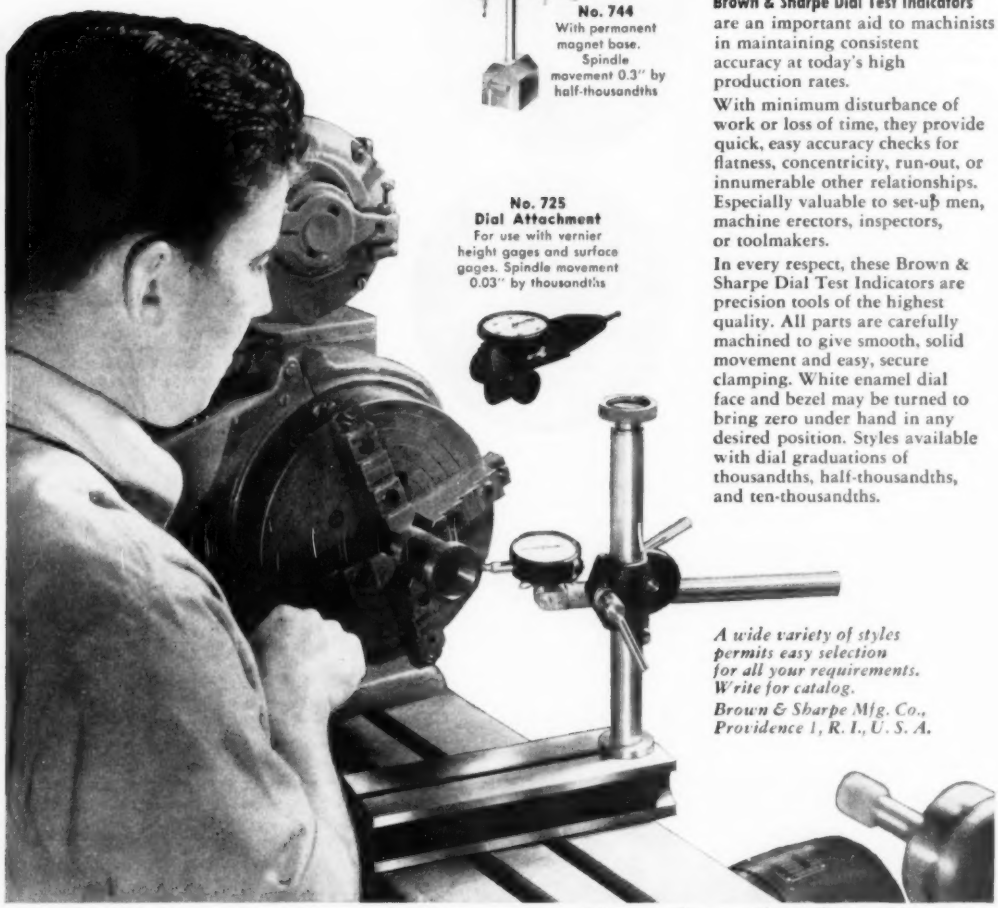

No. 725 Dial Attachment
For use with vernier height gages and surface gages. Spindle movement 0.03" by thousandths

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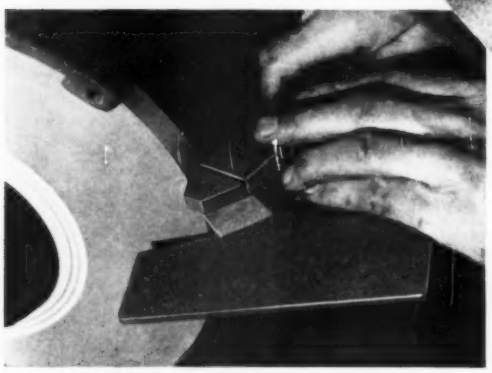
It's really big news . . . this new "XL" Bond! "XL" is the name of Chicago Wheel's remarkable new line of silicon carbide vitrified grinding wheels . . . especially made for carbide tool and cutter grinding.

"XL" wheels come in the most popular tool and cutter sizes and steel backs. They're designed for efficient, economical, rough and finish grinding . . . offhand or precision automatic. And they're already proving themselves on the job, helping to keep the nation's carbide tools and cutters in first-class shape for the mobilization program. "XL" is unexcelled . . . and another 1st for Chicago Wheel!



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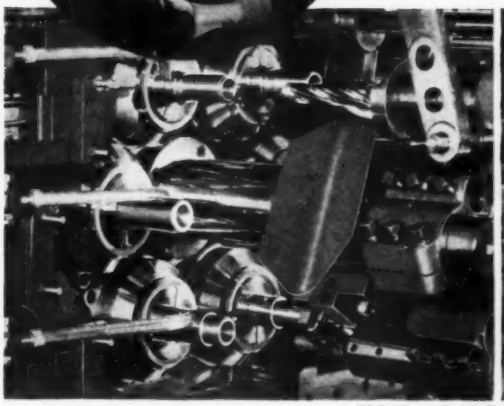
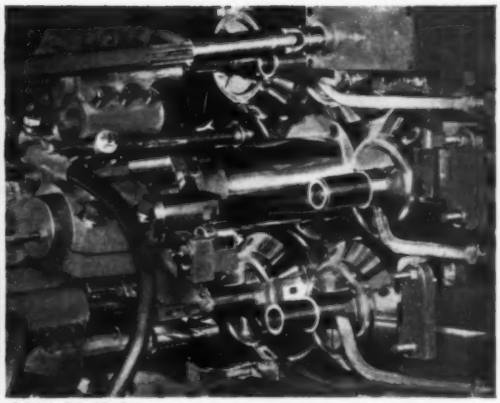




FRONT AND REAR SIDES OF 2⅝-SIX

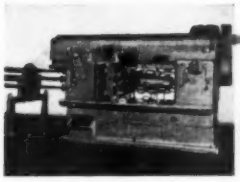
Multiple Spindle Bar Automatics produce more work per square foot of floor space than do other types of metal cutting machine tools. But, when *one* spindle is "down" *all* are "down." It's why dependability will always be the outstanding requirement of the "Automatic."

So many factors are involved in dependability that any weakness in design, engineering, material, or construction, will eventually contribute to higher costs of operation and maintenance.

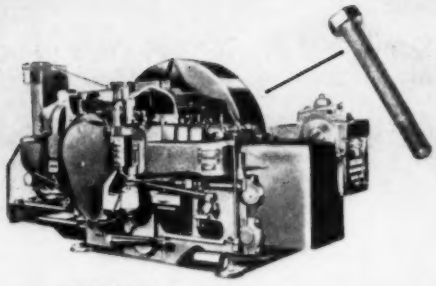
Part of any new machine's service to the prospective user is the availability of *full* information. No prospective purchaser need "settle" for less. At least it's that way with CONOMATICS.

In producing the piece shown, on a 2⅝-SIX, the eccentric forming attachment (see upper right illustration) combines the well known CONOMATIC facilities of form tool support and "all position" attachment spindle drive.

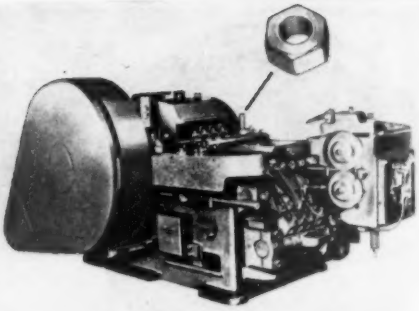
A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



BOLTMAKER



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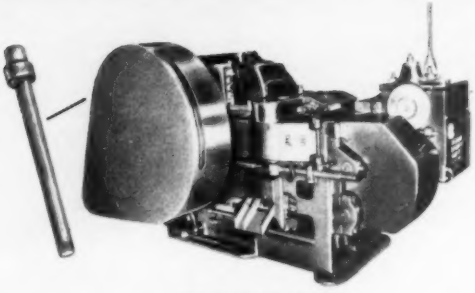
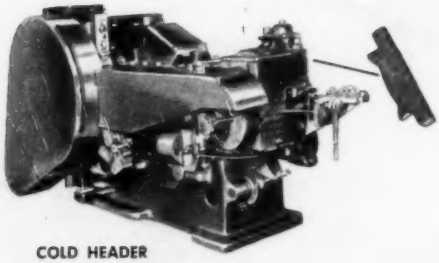
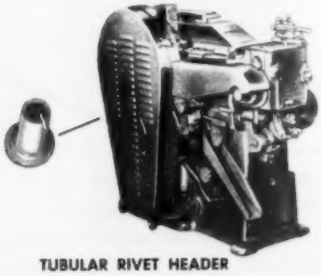


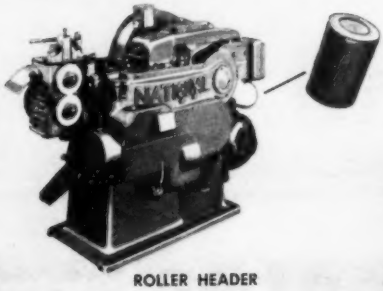
PROGRESSIVE HEADER



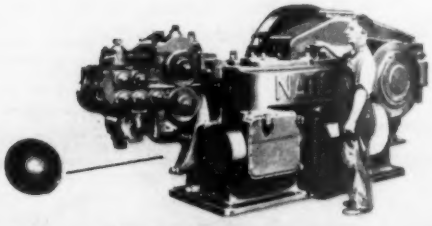
COLD HEADER



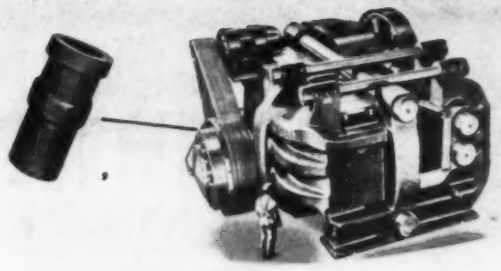
TUBULAR RIVET HEADER



ROLLER HEADER



BALL HEADER



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For example, large automobile crankshafts are finish-forged on a MAXIPRES weighing 1,600,000 pounds . . . five-penny nails stream from a NAILMAKER all day long 13 a second . . . ball-point pen balls, so small it takes 111,000 to make a pound, are made automatically from coiled wire on the smallest Cold Header.

NATIONAL'S all-around experience covers the full range of forging—hot and cold, large and small, ferrous and non-ferrous.

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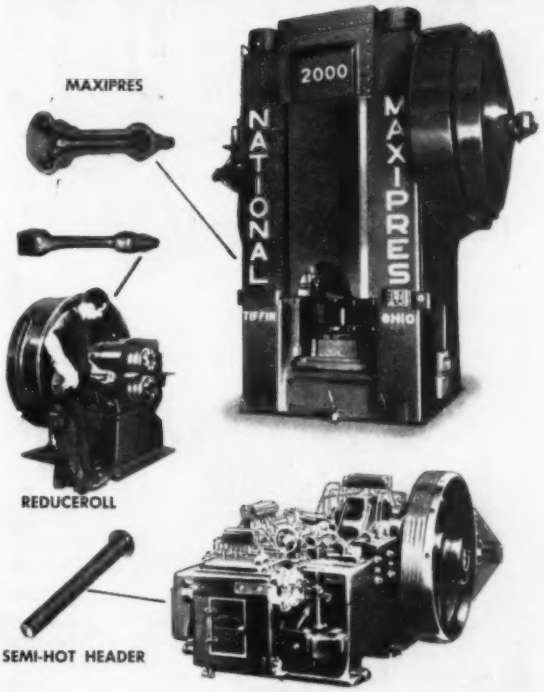

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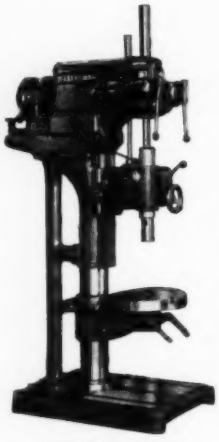
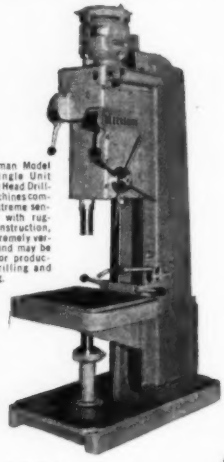
THE CLEEREMAN LINE

OF PRECISION JIG BORERS and DRILLING MACHINES

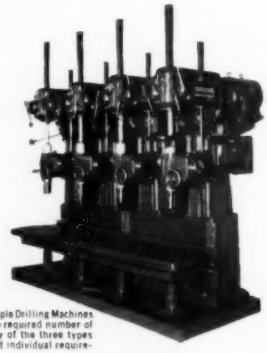


Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost and are general purpose machines with high production.



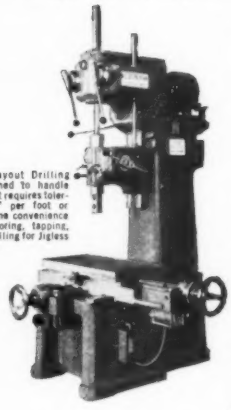
Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.

Cleereman Jig Borers noted for unexcelled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled prepositioning.



Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.

Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.



Cleereman Layout Drilling Machine designed to handle layout work that requires tolerances of .001" per foot or broader. Extreme convenience for drilling, boring, tapping, reaming and milling for Jigless manufacturing.

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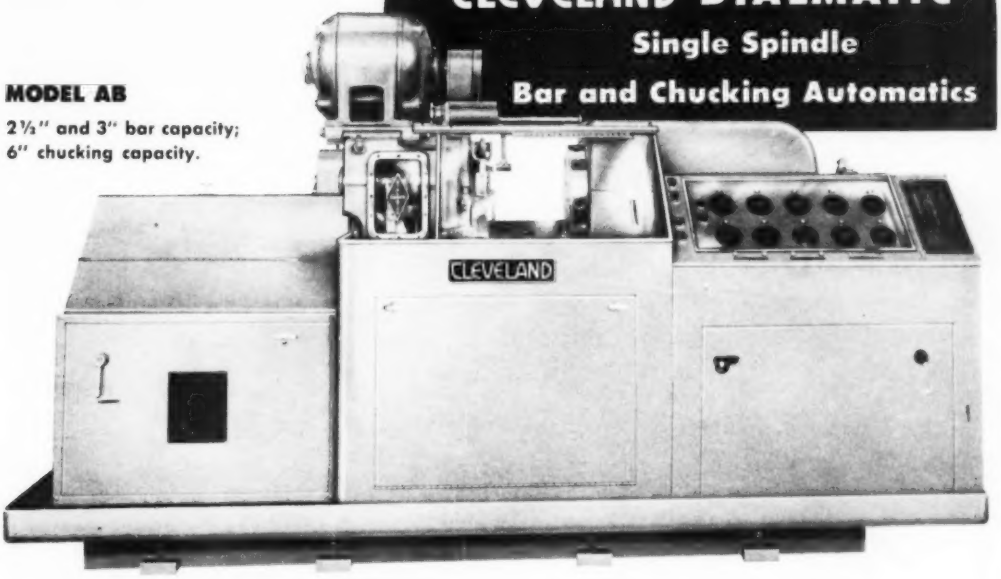
CLEVELAND DIALMATIC
Single Spindle Bar and Chucking Automatics

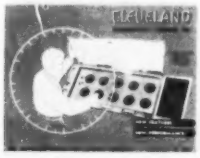
MODEL AB

2⅛" and 3" bar capacity;
6" chucking capacity.



The most *VERSATILE* single spindle automatic in the field!

This New Bulletin Gives Complete Details. Write for Your *Free* Copy



Find out now how much you can save on your parts production with the Cleveland *Dialmatic*. Ask Cleveland engineers to submit a direct proposal with production estimates on your work. There is no obligation.

Remember: *Clevelands Cut Costs*

Incorporating many important advancements in screw machine design, the Cleveland *Dialmatic* sets new standards of economy for full automatic production of short-run jobs formerly produced only on hand-operated machines.

Electric Feed Drive pre-selects highly accurate feed rates for all five turret tools, simply by positioning dials on the control panel. No cam changes.

112 Spindle Speeds from 24 to 1820 r.pm. provide efficient cutting speeds for all metals — all types of tools. Four automatic speeds available through hydraulically shifted clutch and two-speed spindle motor.

Quick Set-Up, provided by Electric Feed Drive, further shortened by universal camming; patented Cleveland quick-change collet; hand crank stock feed adjustment; and many other time-proved Cleveland features.

Converts from Bar Machine to Chucker in 30 minutes by substituting a low-cost 6" power chuck attachment for the stock feed group in the spindle.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • SO. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Tips on barrel-finishing
MAKE TEST RUNS under actual production conditions before establishing operating procedure. Pre-determine exact size and amount of abrasive, ratio of parts to abrasive, amount of water, amount and type of cleaner, and barrel rpm for best results.
USE A CLEANER with a rust preventive agent when ferrous parts are tumbled. Dry and rust-proof parts immediately after barrel-finishing.
SEPARATE WORK FROM ABRASIVE with hand screens, when production is small. Use mechanized rubber-coated screens where production is large. Magnetic or non-magnetic separators are also available.
SCREEN TUMBLING ABRASIVE periodically, to maintain close grading. Grinding action within barrel eventually wears grains down. Periodic screening assures consistently uniform results.
ADD NEW ABRASIVE to the load periodically to compensate for loss of abrasive through gradual wear. This keeps ratio of abrasive and parts at best predetermined figure.

SPECIFY Norton ALUNDUM* Tumbling Abrasive for continuous cutting action — fast, positive cut — long, productive life. If you do not have barrel-finishing equipment, let Norton make test runs for you — at no obligation. Whether or not you have equipment, get your copy of Norton's new, informative, free booklet "Barrel-Finishing with ALUNDUM Tumbling Abrasive" — full of practical hints. Ask your Norton distributor or representative for Form 501. Or write us direct.

NORTON COMPANY, Worcester 6, Mass.
Distributors In All Principal Cities

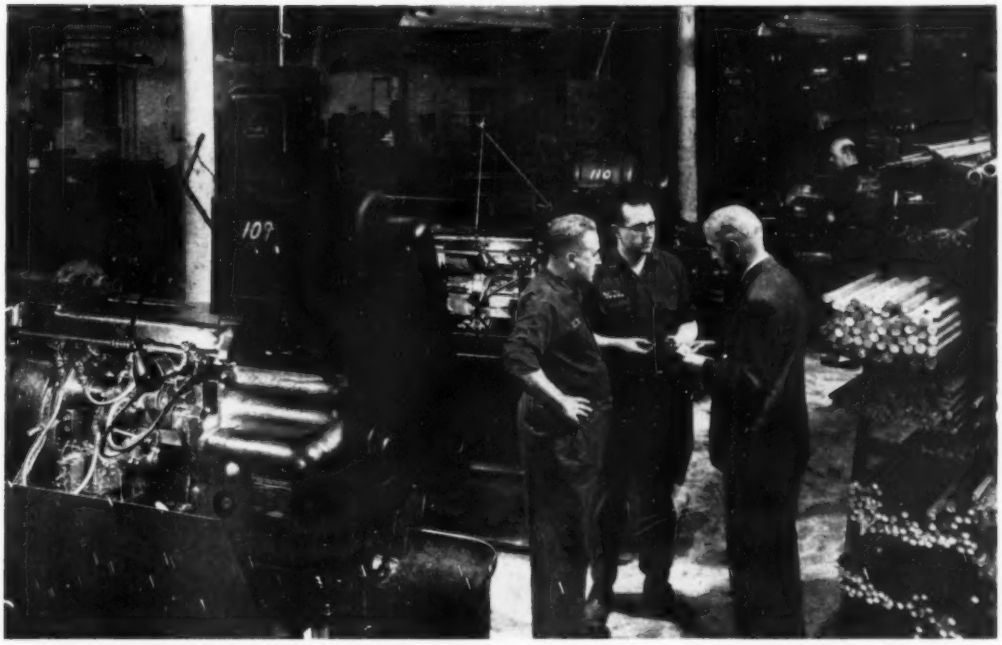
NORTON
ABRASIVES
Making better products to make other products better

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

"With **Gulf Electro Cutting Oil**

we increased tool life from 5 to 8½ hours on stainless steel races"

says Herman Busch
President, Buswell Metal Products, Inc.



"We've found that the new Gulf Electro Cutting Oil is ideal for all-round service on 6-spindle automatics," says Mr. Herman Busch, President, Buswell Metal Products, Inc., Kensington, Conn. "On tough stainless steel ball races, for example, we've increased tool life from 5 to 8½ hours and we're getting excellent finishes with this outstanding cutting oil."

This is typical of reports from the scores of plants which have made some improvement in production or tool life through the use of Gulf Electro Cutting Oil, the new sulphurized cutting oil that, because of greater sulphur activity, provides better protection for the tool.

Call in a Gulf Lubrication Engineer today and let him help you find opportunities for reducing machining costs through the use of one or more of the quality cutting oils in Gulf's complete line. Get in touch with your nearest Gulf office. Or send the coupon below for further information.

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719 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your pamphlet "Gulf Electro Cutting Oil."

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Company .....
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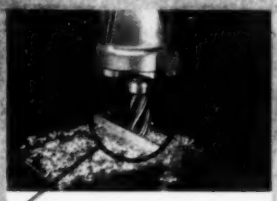


ACCURATELY SHARPENED CUTTING TOOLS WILL *cut costs as well as metal*

Operation of P&W CUTTER & RADIUS GRINDERS is simple. Their performance will save $$ in any Die Shop or Toolroom — save more $$ in Production Departments by increasing the productive life of Cutters—and save still more $$ in the Grinding Department by paying for themselves in short order. Get full details from any P&W Branch Office.

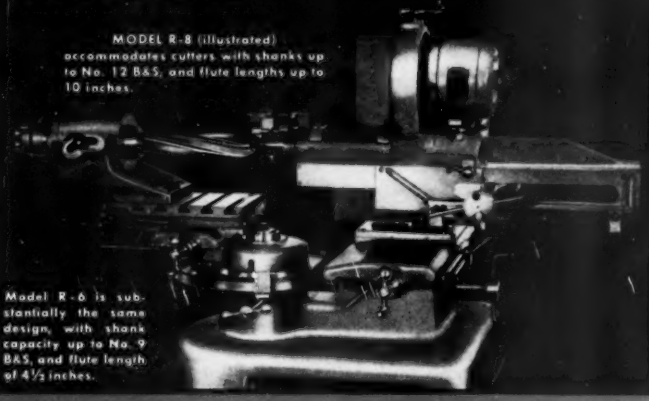
SAVE $$$ AND DO A BETTER, MORE ACCURATE JOB WITH

PRATT & WHITNEY

CUTTER AND RADIUS GRINDERS

This versatile Machine is designed for efficient, economical sharpening of End Mills, Keller Cutters and their corresponding Tracers, and Die Sinking Cutters — stock or special. It assures exact radii for ball and radius nose cutters . . . tangential blends . . . uniformity of flutes whether cylindrical or tapered . . . concentricity with shank (therefore with spindle) . . . and provides Cutters that cut cleanly, smoothly, at the most profitable speeds. Due to the versatily inherent in its design it also sharpens Side or Face Milling Cutters, Form and Thread Milling Cutters and Form Tools for Lathes, Planers and Shapers.

MODEL R-8 (illustrated) accommodates cutters with shanks up to No. 12 B&S, and flute lengths up to 10 inches.



Model R-6 is substantially the same design, with shank capacity up to No. 9 B&S, and flute length of 4½ inches.

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY

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Dedicated to Accuracy for 91 years

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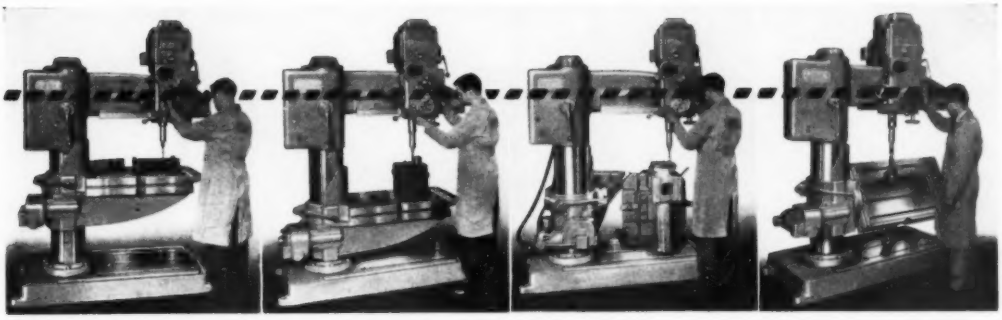
no reaching....
or crouching....
for any job....



WITH A FOSDICK SENSITIVE RADIAL DRILL

You can drill holes up to 1½", in small or large work—*all from the same normal operating position* on this unique machine.

The Fosdick Sensitive Radial Drill is another in a long line of Fosdick "firsts." It fills the gap between the Radial and Sensitive or Upright Drill, gives you exceptional versatility, *plus* operator convenience never possible before.

The arm of this machine—always at the same height—swings 360°. The table, which moves up and down on the one-piece column, also swings 360°. It may be provided with the tilting feature illustrated. A machine base is provided for work too large for the clearance between spindle and table.

Get the whole story on this unique machine. Its moderate price and outstanding features will mean more profitable drilling in your shop. Call your Fosdick Distributor today or write for Bulletin SRA.

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

FOSDICK

ARMSTRONG

Quality TOOLS

NOT A COST, BUT AN INVESTMENT

That Pays Year After Year . . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

IMMEDIATE DELIVERY

from NEW YORK, CHICAGO, KANSAS CITY, NEW ORLEANS, DALLAS AND LOS ANGELES WAREHOUSES

ACEC

Integral Horsepower Electric Motors— ¾ to 200 hp.

Motors made by one of the largest manufacturers of electrical equipment on the continent . . . the 70-year old firm, Ateliers de Constructions Electriques de Charleroi of Belgium . . . are now stocked—¾ to 200 horsepower—in six U. S. cities, making it possible for American customers to receive immediate deliveries out of warehouse inventories.

Manufactured strictly to **NEMA FRAMES AND SPECIFICATIONS,** *ACEC motors for 3 phase current incorporate the electrical and mechanical excellence that only long experience and scientific research can produce. The ACEC of Belgium has long specialized in the complete equipment of power stations throughout the world. Quite natural, therefore, that ACEC motors enjoy world-wide recognition.*

Branches and representatives of ACEC blanket 50 countries of the globe. Service in the United States alone is available from **232 DISTRIBUTORS AND SERVICE SHOPS.** *Write, wire or telephone your requirements.*

All ACEC Motors are FULLY GUARANTEED

Available in the following types:

- **Open Drip Proof Motors**
- **Totally Enclosed Fan Cooled Motors**
- **Pump Motors:**
  - Style "C" Face Mounted
  - Style "P" Vertical Solid Shaft
  - Submersibles
  - Vertical Hollow Shaft
- **Adjustable Speed Schrage Motors.**

Motors exceeding 200 hp. are built to order.

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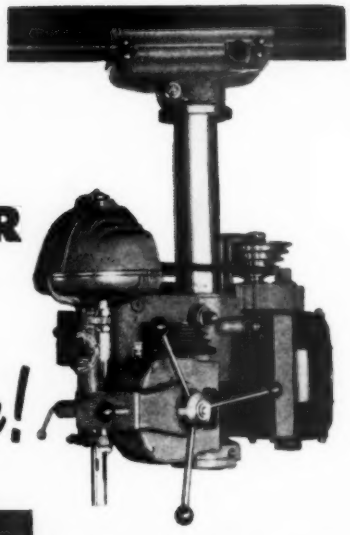
Electrical Engineers and Manufacturers

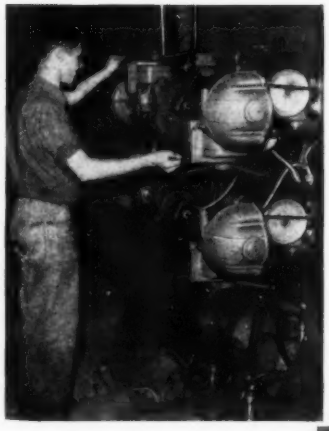
Because they're designed to operate in any position, "in-line", and around-the-clock

WALKER-TURNER DRILL HEADS

save setup and machining time!



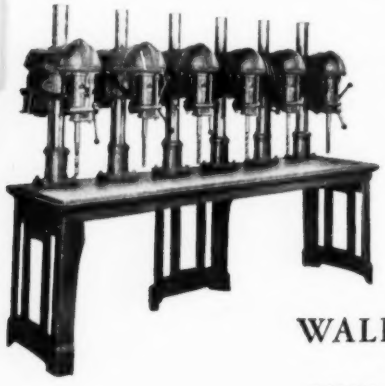
(Right) **Simultaneous Drilling Operation**
On this job, four standard Walker-Turner Drill Heads are mounted horizontally to drill both ends of two double-end tube closures simultaneously. 8 separate operations are consolidated into one, saving machining time.



(Above) **Overhead Drill Press Assembly**
To reduce overall drilling time, an aircraft manufacturer mounts a 20" Walker-Turner Drill Head on a sliding carriage supported by an overhead steel tube. Ball bearings in carriage provide easy lateral movement. Head may be swung in a complete circle.

(Below) **Multiple Mounting**
"In-line" arrangement of Walker-Turner Drill Presses can speed part output on many jobs where a series of holes are to be drilled, tapped, reamed or counterbored in a single work piece. Multiple models such as this have been in constant use for over 5 years.

(Below) **2 Drill Heads Working at Once**
To rough grind lens blanks to specified curvature, two Walker-Turner Drill Heads here work in conjunction. Not only is machining time reduced substantially, but the required accuracy is assured.



Your Walker-Turner Distributor can help you take full advantage of the flexibility of these production tools. Let him demonstrate how Walker-Turner 15" and 20" Drill Presses are designed to increase production — *in more ways than one.*

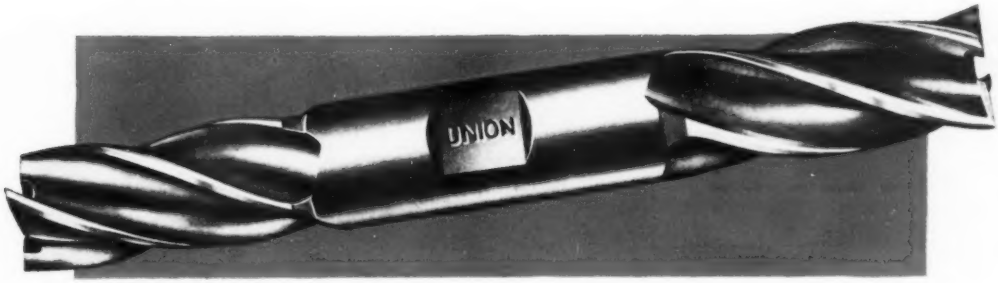
SOLD ONLY THROUGH AUTHORIZED DEALERS

WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

Drill Presses • Radial Drills • Tilting Arbor Saws • Belt and Disc Surfacers • Metal-Cutting Band Saws • Metal-Spinning Lathes • Spindle Shapers • Jointers

You cut costs as well as metal... with UNION *end mills*

UNION DOUBLE-END END MILLS are available with four flutes — as illustrated — or two flutes, in standard or small-diameter sizes. All in high speed steel.



BUILT FOR MAXIMUM ECONOMY, Union end mills provide top performance throughout the range of end milling operations. Made of high speed steel, they have the smooth, free-cutting action that saves power, while their great strength reduces breakage to a new low. And all Union solid type end mills of ½" diameter or over have deep counterbores, considerably lengthening their resharpening life. In fact, as with all Union cutting tools, every detail of their design and construction is the result of up-to-the-minute tool engineering that saves you time, labor and money . . . *And that's worth specifying!*

THERE'S A TYPE OF UNION END MILL FOR EVERY PURPOSE

Taper Shank	**Single End**
Straight Shank	**Double End**
Shell	**Ball End**

Union is also prepared to make special types of end mills to your specifications.

no other end mill will outperform a UNION

contact your local distributor

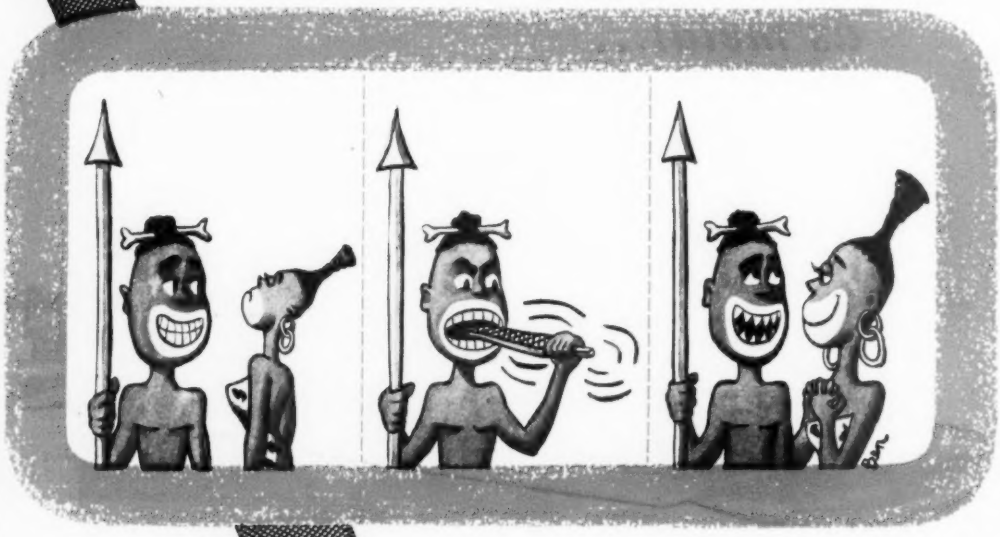
His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist."

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

"A Nicholson File for Every Purpose" is the caption over which this cartoon appeared in one of a series of advertisements in The Saturday Evening Post.



The right teeth make a big difference

Enlarged "horizon" (cross section) of the teeth of a typical Nicholson file.

Proper design, even height, uniform sharpness and correct hardening of teeth are tremendously important in lengthening the life and increasing the efficiency of files. Such qualities take on added significance as defense preparedness calls for production speed-ups, steel conservations and maximum tool wear. They are "naturals" in Nicholson products.

Nicholson file manufacture has *always* given uppermost thought to the designing, cutting and heat-treating of the myriads of tiny teeth which constitute the vital "business ends" of one of industry's most indispensable hand tools.

Thus, it can be said that Nicholson and Black Diamond files "speak through their teeth." And what they say is, *"Twelve perfect files in every dozen*—made from top-quality file steel and 87 years' experience."

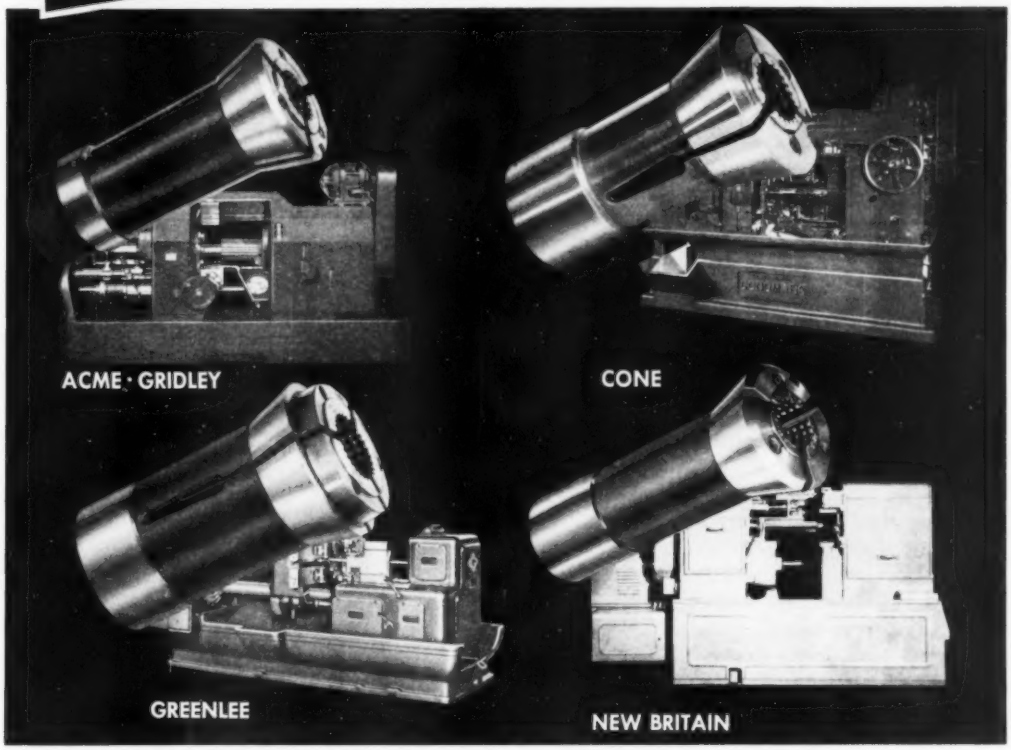
Sold through industrial distributors throughout the world.

How to select, use and care for *The right file for the job* is interestingly described with words and pictures in Nicholson's famous 48-page book, "FILE FILOSOPHY." FREE . . . send for as many copies as you can judiciously place in the hands of your key production and purchasing personnel.

NICHOLSON
A FILE FOR EVERY PURPOSE

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

HARDINGE ELMIRA, N.Y. Master Collets and Pads for MULTIPLE SPINDLE AUTOMATICS

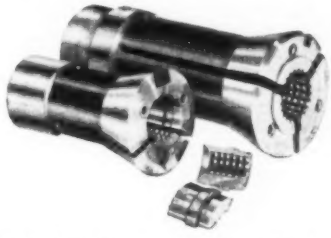


Equip your multiple spindle automatics with HARDINGE Master Collets and Pads—for solid collet performance at low cost.

Available for the following machines up to and including 3½" capacity: Cone; Greenlee; Gridley and Acme-Gridley; National Acme and New Britain.

- o Size changes permitted without removing collet from Spindle.
- o Final tightening possible for pads when closed on bar stock.
- o Lower cost—compare pad price with solid collet, and you will standardize on Hardinge Style "S".
- o Design affords maximum strength.
- o Greater accuracy — because pads are ground accurately on an arbor.
- o Lower inventory possible — pads interchange among different makes of automatics with similar capacity.

Hardinge Style "S" Sure Grip Master Collets and Pads



Write for Style "S" Bulletin—contains complete descriptions, specifications, and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Protect Air-operated Equipment Against Moisture and Dirt

The positive way to remove moisture and dirt from compressed air lines is to use the Cuno MICRO-KLEAN Air Line Filter.

This unique cartridge-type filter removes all entrained moisture, plus all foreign particles (dirt, pipe scale and other trash) down to 1 micron in size.

The dry, clean air assures more satisfactory performance—and longer life—of pneumatic tools, instruments, paint spray systems, hoists, etc.

Less Work for You

The Cuno MICRO-KLEAN Air Line Filter does its work with less attention required from you because its cartridge needs replacement only half as often.

The resin-impregnated fibres are non-wicking, so the trapped moisture drains promptly. The extra-large moisture-collecting area means less frequent draining.

Pressure drop across the cartridge is slight due to the openness of the structure—80 to 90% porosity—and to the absence of purely structural components (none needed) that offer resistance to flow.

A. Baffle deflects some moisture down outside cartridge.

B. Network of fibres catches remaining moisture and dirt as air works its way through interstices.

C. Trapped moisture drains into collection chamber.

Cuno Engineering Corporation
Dept. 247C, South Vine St., Meriden, Conn.
Please send information on Cuno MICRO-KLEAN
Air Line Filter for .....
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Company .....
Address .....
City .....Zone....State....
Please attach to your business letterhead

The Simplest Filter Cartridge Lasts the Longest...Twice as Long

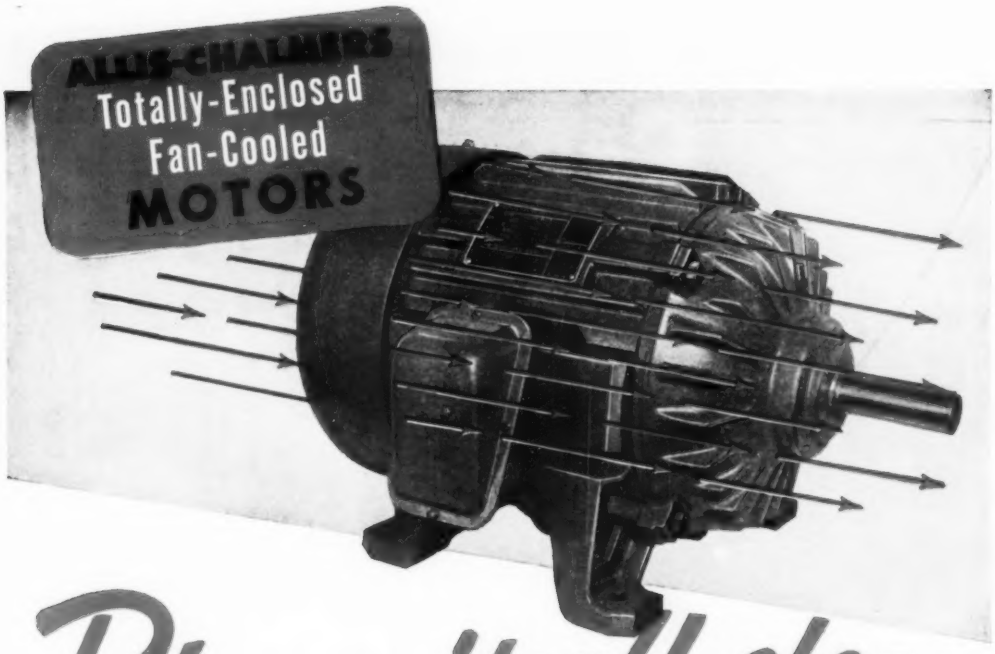
Cartridge renewals are cut at least *in half* when Cuno MICRO-KLEAN replaces any other filter. And throughout its service life, MICRO-KLEAN is *guaranteed* for specific performance.

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
Clean raw water, recirculating water, etc.—FLO-KLEAN



Blows itself clean as a Whistle!

DIRT IS CARRIED AWAY by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor. That means less motor cleaning . . . inspection . . . overhaul!

Concealed air passages and pockets have been eliminated. Dirt can't build up to cause overheating. And as for oily dirt that sticks — just wipe or blow it off.

Studies show that on most applications, totally-enclosed fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3427

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

The case of the missing warehouse!

For many alert businessmen, the big, overcrowded warehouse is virtually disappearing.

The reason? It's because they've found a way to cut their inventory to a minimum!

No huge stock ties up their capital. No sudden price-drop hits them hard. No big storage bills cut their profit.

For they have a "warehouse" in the sky!

Whenever they need parts to keep production lines moving, or merchandise to keep shelves stocked, they get them overnight or sooner—with Air Express!

Whatever *your* business, you can profit by inventory control via the world's fastest shipping service. Here are its unique advantages:

IT'S FASTEST—Air Express gives the fastest, most complete door-to-door pick-up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT—One call to Air Express Division of the Railway Express Agency arranges everything.

IT'S DEPENDABLE—Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE—Air Express expands profit-making opportunities in distribution and merchandising.

For more facts call Air Express Division of Railway Express Agency.

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GETS THERE FIRST

CARD
Ground Thread
TAPS

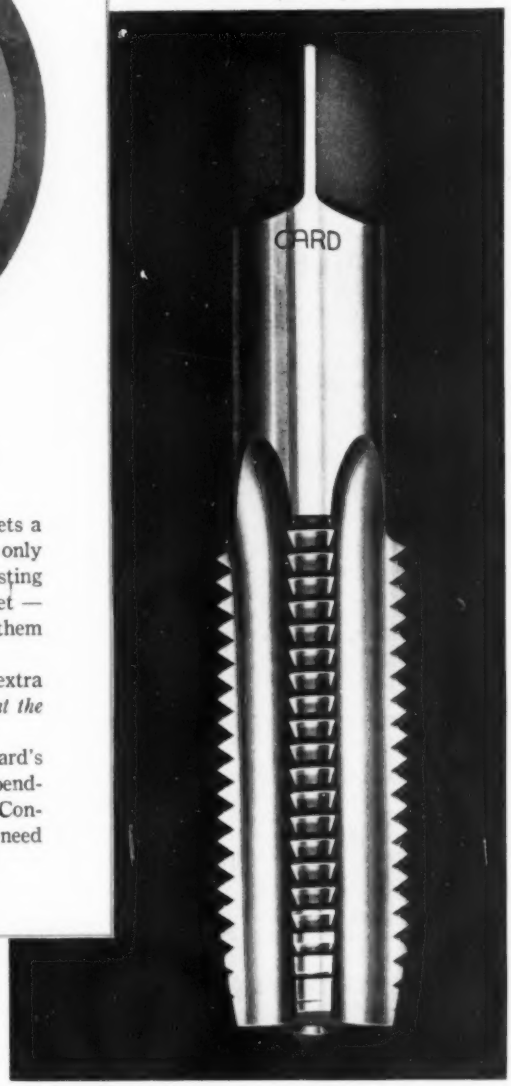
Extra protection...
At no extra cost!

Every tap, every cutting tool made by Card gets a rigid factory-inspection. That's routine — but it's only half the story. We also employ the Pittsburgh Testing Laboratory to buy Card Taps on the open market — at places and times unknown to us — and check them again, certifying the results.

This means extra protection for you — at no extra cost. *Because you can buy Card Certified* Taps at the same price you'd pay for run-of-the-mill taps!*

Why be satisfied with anything less than Card's double-checking—with its double assurance of dependability and long, money-saving service life? . . . Contact your Card Distributor for the quality taps you need — and for prompt, cooperative service at all times.

Card Ground Thread Taps are available in both commercial and precision ground threads. When precision ground is required, be sure to specify the limit number.



The CARD Quality

TAPS
The Certified Cutting Tools*

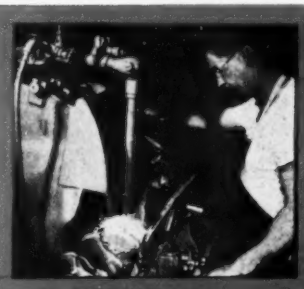
*by the Pittsburgh Testing Laboratory
Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

S. W. CARD
MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.

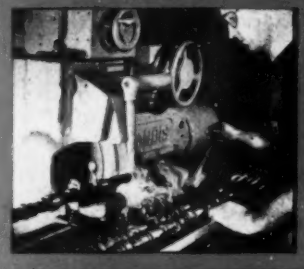
Grind RIGHT with the RIGHT wheel

When you select from the complete line of grinding wheels by CARBORUNDUM, you can be sure of getting the proper wheel backed by an adequate performance record. That's why it's always a good rule for better grinding to buy Abrasives by CARBORUNDUM.

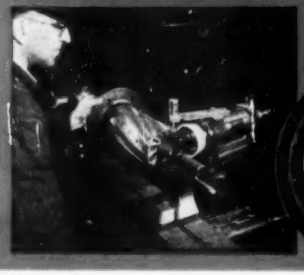
● **They'll grind more crankshafts per wheel.** V11 bond wheels by CARBORUNDUM remove stock at an exceptionally high rate, yet heat generation and wheel wear are low. Look for better finish, size and form due to reduced grinding pressures.

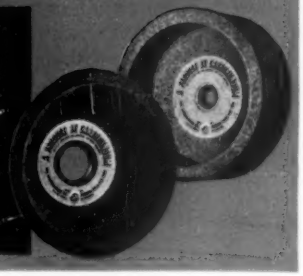


● **They'll hit the close tolerance requirements of camshaft grinding.** BY resinoid bond wheels by CARBORUNDUM will maintain a uniform high cutting rate while giving improved finish.



● **They'll give you fast, accurate, repetitive grinds.** V20 bond wheels by CARBORUNDUM are at their best in the tool room. A sharp cutting action combines with excellent form holding qualities to impart a uniform fine finish that helps extend tool life between grinds. A versatile wheel, fewer grades for a greater variety of jobs—lower inventory required.





See your **CARBORUNDUM** distributor...or write Dept. AM 81-34.

Only CARBORUNDUM

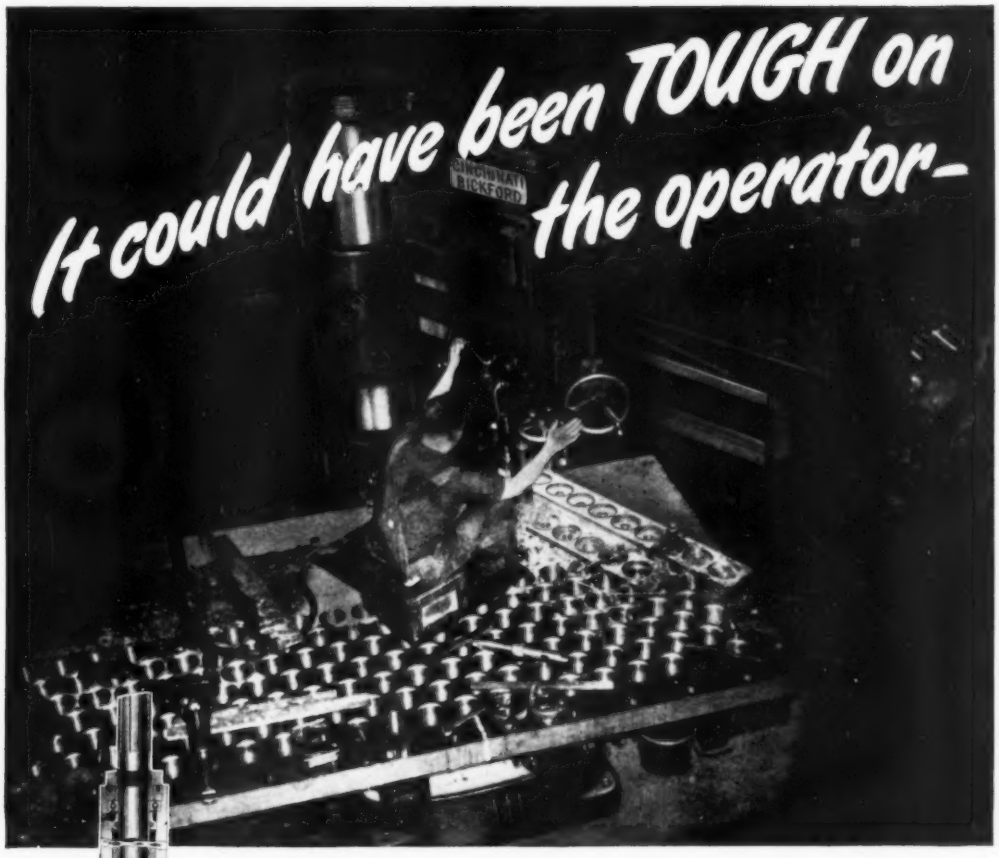
TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N.Y.

makes ALL Abrasive Products ...to give you the proper ONE

81-34

It could have been TOUGH on the operator—



Contributing to the unusually long trouble-free performance of Super Service Radial Drills is the spindle and sleeve construction. Note that the sleeve and its spindle supporting bearings feed down with the spindle so that no matter what length of feed is required or how far the spindle is extended from the head, it never feeds away from its supporting bearings, but is always rigidly supported by these bearings just above the spindle nose.

Power, stamina, accuracy and concentrated operator control were all required on this job.

One drilling and two fly cutting operations were performed. Size of holes: 5", material 6½" armor plate. From a minimum of fifty holes to several hundred were produced per piece.

The Cincinnati Bickford Super Service Radial Drills give a sustained accurate and speedy performance—with maximum ease to the operator.

Write for Bulletin R-29 for details on this modern powerful radial drill.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 21" dia. col. 2½" arm. to 56" dia. col. 12" arm.
General purpose Uprights 21" to 28" sizes.
Production Uprights 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

TRY THIS *cost-cutting team* **for CARBIDE GRINDING**

Wickman Steel-Bonded Diamond Wheels practically indestructible with extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

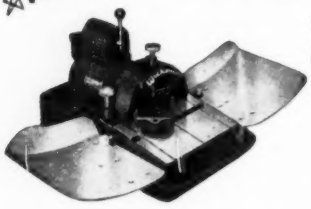
Wickman Resinoid-Bonded Diamond Wheels for faster and freer carbide cutting and less frequent wheel dressing.

Wickman Chip-Breaker Diamond Wheels steel-bonded for much longer life than other chip-breaker diamond wheels. Reduce wheel and tool costs materially and speed grinding 3-4 times.

Complete facts in free 52-page catalog.

Grinding with Diamond or Abrasive Wheels is

☆FAST! ☆ECONOMICAL!

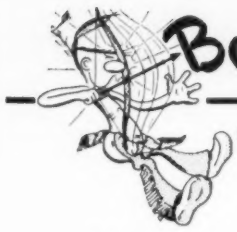


on the Wickman GF-2-A

With 1 HP reversible motor and impeller-type 12 gph coolant pump, this heavy bench grinder delivers fast, economical grinding with both silicon carbide abrasive wheels and Wickman steel-bonded diamond wheels. Wheel guards and splash protectors, three position table for wheel wear adjustment, plus a protractor slot for angular grinding, make this the ideal grinder for all off-hand grinding around the shop.

Delivery From Stock. Send for bulletin.

THE Wickman MANUFACTURING CO.
15533 Woodrow Wilson Ave.
DETROIT 3, MICHIGAN



Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Arbortration

I wonder if you could settle a little argument about nomenclature. When a piece of work is mounted on a shaft for turning between centers, I claim that the proper name for the shaft is "arbor." My friend claims that the proper name is "mandrel," which I maintain is just an old-fashioned word that is no longer used.

H. Dubois
New Orleans

Sorry, Mr. Dubois, but your friend is correct. The term, arbor, is frequently misused, but should be confined to the shaft which holds the cutting tool. The shaft which holds the work is correctly termed a mandrel. The word is old, but not old-fashioned.—Ed.

I Remember

In reference to "Way Back When" (*AM*, Aug 20, 1951), I remember that as an apprentice at Brainard Milling Machine Co., 1884-1888, we attached Hill Clark & Co. nameplates to many machines. I think Manning, Maxwell & Moore came later.

John Bath, who made taps in Worcester, and John T. Slocomb, who made micrometers in Providence, worked at Brainard's at the same time. We used to buy *AM* weekly at 6¢ a copy.

The educational and incentive value of *AM* is shown by the rise of the two Johns mentioned above. I became an associate member of ASME in 1897.

Walter G. Holmes
Minneapolis

As most of our readers know, John Bath still makes taps in Worcester, and John Slocomb still makes micrometers in Providence.—Ed.

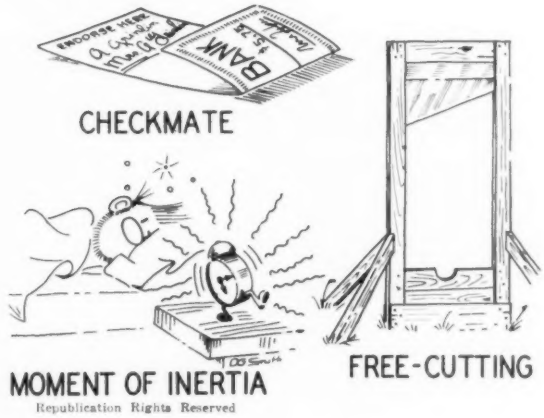
Guns or Butter

The "butter plus guns" philosophy expressed in your editorial (*AM*, Aug 20, 1951) is perfectly wonderful when it works. A friend of mine in the electrical appliance business tells me he can get all the refrigerators, stoves, and household appliances he can possibly sell. His problem is sales. Storerooms are packed with goods, and he sees no real or apparent shortages in his field.

On the other hand, my business puts me in touch with at least 200 production shops, employing over 130,000 men, and I hear nothing but

GRINETICS

BY D. G. SMITH



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• • • • • • WIDE VARIETY • • • • • •

We stock and process all types of abrasive sticks manufactured by the three largest, best equipped and most experienced abrasive manufacturers in America. You have your choice:

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We maintain four processing plants and warehouses:

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We assume full responsibility for the results obtained with your honing equipment. As the principal manufacturer of honing equipment for over twenty years we have a large, experienced staff of Honing Engineers and Service Technicians. The accumulated know-how of this organization plus the technicians of the three abrasive companies are at your service when you BUY MICROMATIC HONING ABRASIVES.

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Write for your copy of Cross Hatch on MICROHONING ABRASIVES

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NOBLEWEST PRECISION MARKING DIES

Last Longer—Give Better Impressions

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MARKING
★
GRADUATING
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KNURLING
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EMBOSSING
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DEBOSSING

Noblewest makes dies for marking practically every type of surface, including round, flat, concave, convex and irregular contours. Noblewest dies are of one quality—the finest that human skill and every modern technical facility can produce. Noblewest dies for marking designs, names, addresses, trademarks, numbers and graduations have become the standard for clear impressions and longer life—*yet they are competitively priced.* Noblewest dies are made of specially selected steel, precision engraved to extremely close tolerances, and heat treated for extra long wear. Every Noblewest die is rigidly inspected and Rockwell tested for hardness. Large facilities permit prompt delivery. Send detailed specifications on your requirements and we will gladly submit quotations. The Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Connecticut.

NOBLEWEST DUPLICATE DIES

Easily ordered by number

As a service to our customers we will gladly serial number your Noblewest dies when requested. Exact duplicates can then be ordered by number only.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

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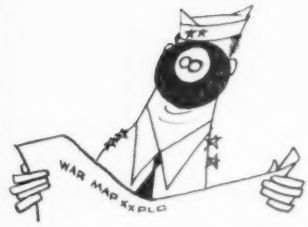


groans and curses about the difficulty of obtaining raw and semi-finished material, and unit components.

From the knot-hole through which I view the world, I see too much butter and not enough guns. I think that if you would survey the field you would find that practically every program in the entire defense setup is back of the 8-ball on deliveries.

On the face of it, your editorial makes sense, but underneath, the situation is not nearly so rosy, and there is nothing whatsoever in the picture I can see that makes for complacency.

If you want proof of what I am driving at, why not put out an inquiry for a few hundred tons of steel castings, or try to buy copper in any form whatsoever. Even sizeable gray iron castings could provide a clue. And last, but not least, go try to buy a standard machine tool.

Yes, we're getting both butter and guns, but the vast quantity of butter is choking us, and the military outfits who are waiting for their equipment are trying to figure ways and means of shooting some of it at Uncle Joe.

I am afraid your editorial gives a completely erroneous impression, and if people at large get the idea that we can go along the way we are doing, they are in for a painful disillusionment.

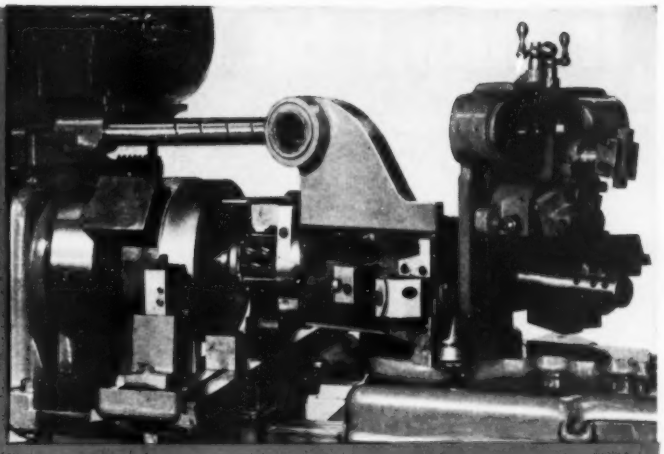
R. W.

Beg Pardon

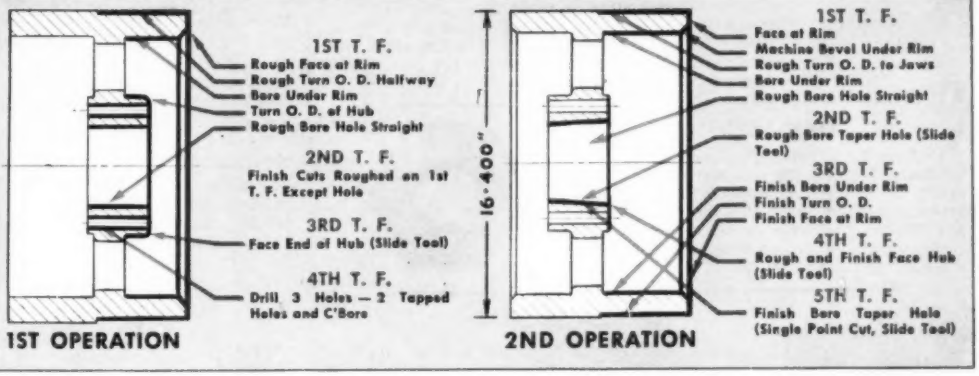
May I point out two errors which occurred in the item you ran in Talking Shop (*AM*, Aug 20, 1951), concerning the rolling of stainless steel? First, you say, "from R_b 92-25 to R_c 33-35." Apparently, 92-25, particularly the 25, is a typographical error. It should be 78-85.

The other point is the two parenthetical remarks, "suitable up to 800F" and "up to 1400F." One of your readers misinterpreted this, and telephoned me for an explanation. He had gained the impression that for temperatures above 800F, Type 302 could not be used, and it would be

QUALITY CONTROL IN QUANTITY PRODUCTION BEST ACHIEVED WITH P&J CARBIDE TOOLING SET UP ON THE



P&J 5DE AUTOMATIC


1ST T. F.
Rough Face at Rim
Rough Turn O. D. Halfway
Bore Under Rim
Turn O. D. of Hub
Rough Bore Hole Straight
2ND T. F.
Finish Cuts Roughed on 1st T. F. Except Hole
3RD T. F.
Face End of Hub (Slide Tool)
4TH T. F.
Drill 3 Holes — 2 Tapped Holes and C'Bore
1ST OPERATION
16-400"
1ST T. F.
Face at Rim
Machine Bevel Under Rim
Rough Turn O. D. to Jaws
Bore Under Rim
Rough Bore Hole Straight
2ND T. F.
Rough Bore Taper Hole (Slide Tool)
3RD T. F.
Finish Bore Under Rim
Finish Turn O. D.
Finish Face at Rim
4TH T. F.
Rough and Finish Face Hub (Slide Tool)
5TH T. F.
Finish Bore Taper Hole (Single Point Cut, Slide Tool)
2ND OPERATION

You should see it in operation — this typically efficient P&J high-speed method for machining Pulleys on a precision-production basis. The machine best fitted for the job is the P&J 5DE Power-Flex Automatic with its 17 inch swing over the cross-slide. The Tooling on its 5 turret faces and cross-slide consists mainly of P&J's *standard* turret tool units, augmented by P&J-designed slide tools for machining the hub ends and taper hole, and a P&J-designed multiple spindle drill head which is aligned automatically for the proper position of the 5 holes in the hub and which rotates with the work. The cycle of operations is fast and fully automatic . . . results in faster and better machining . . . to closer limits of accuracy . . . with fewer rejects . . . at a highly profitable rate of production.

Numerous similar examples of productivity with P&J Tooling on P&J Automatics are illustrated in this free Booklet. Write for your copy.

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Precision Production Tooling for 53 years

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TO YOU

only PRESTOLE builds ALL
SHEET METAL NUTS With a 360° Grip

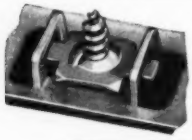
Over 1,000 Shapes and Sizes

"J" NUT

"J" Nuts—to fit all metal from .020 to .090 thick. Sizes from 6-32 to 5/16 machine and sheet metal screws. Made in all finishes. Same availability on "U" Nuts as "J". All with the conical dome formed with a full 360° locking grip around screw. No prongs to flatten or break.

HEX-LOX

Hex-Lox—the Hex Nut with both the 360° conical thread grip and the side-arm thread grip. Weighs 70% less than conventional lock nuts. Has highest installation torque, prevailing torque, and back off torque. Excells in vibration tests and tensile strength. Made in 5 screw sizes from 6-32 to 1/4-20. SAE-1060 steel .016 to .020 thickness.



CAGE NUT

One-Piece Cage Nuts—combines both nut and cage in one piece. No prongs. Full 360° unbreakable thread grip. Saves material, cuts parts in half, saves handling and assembly time. Made of SAE-1060 steel in all popular sizes.

PUSH ON

Push-Ons—for smooth studs. The PRESTOLE push-on clover leaf nut has also become very popular because of its 4 point spring tension bite on smoothest studs, whether metal, fibre or plastic. All sizes and finishes.

The growing demand for more PRESTOLE fasteners is due largely to its unique, precision engineered conical grip that bites a full 360° into the root of the screw thread. It's in all PRESTOLE fasteners except those made for smooth studs. PRESTOLE fasteners are preferred because of their greater holding power. Hundreds of millions in use on automobiles, trucks, refrigerators, stoves, heaters, radio, TV and scores of other products. In writing for samples, kindly send blueprints or details of application.

FAMOUS—FASTENERS

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necessary to go to Type 347 and 321.

Actually, all these grades thread roll without difficulty, provided they are not in the fully hardened condition.

The two temperatures you give are the low and high in the sensitizing range, which applies to all the chrome-nickel steels, except that, in this range, carbide precipitation does not develop on Type 347 and 321.

E. Von Hambach
Carpenter Steel Co.
Reading, Pa.

More Practical Ideas

Most engineers have a habit of jotting down notes on their own brain children in a small pocketbook, and when a tough problem comes along they can often find a suggestion for a solution on these notes.

I would like to suggest that your "Practical Ideas" could be formed into such a pocketbook, preferably in loose-leaf form, classified and printed on good, heavy paper. This could be done about every three

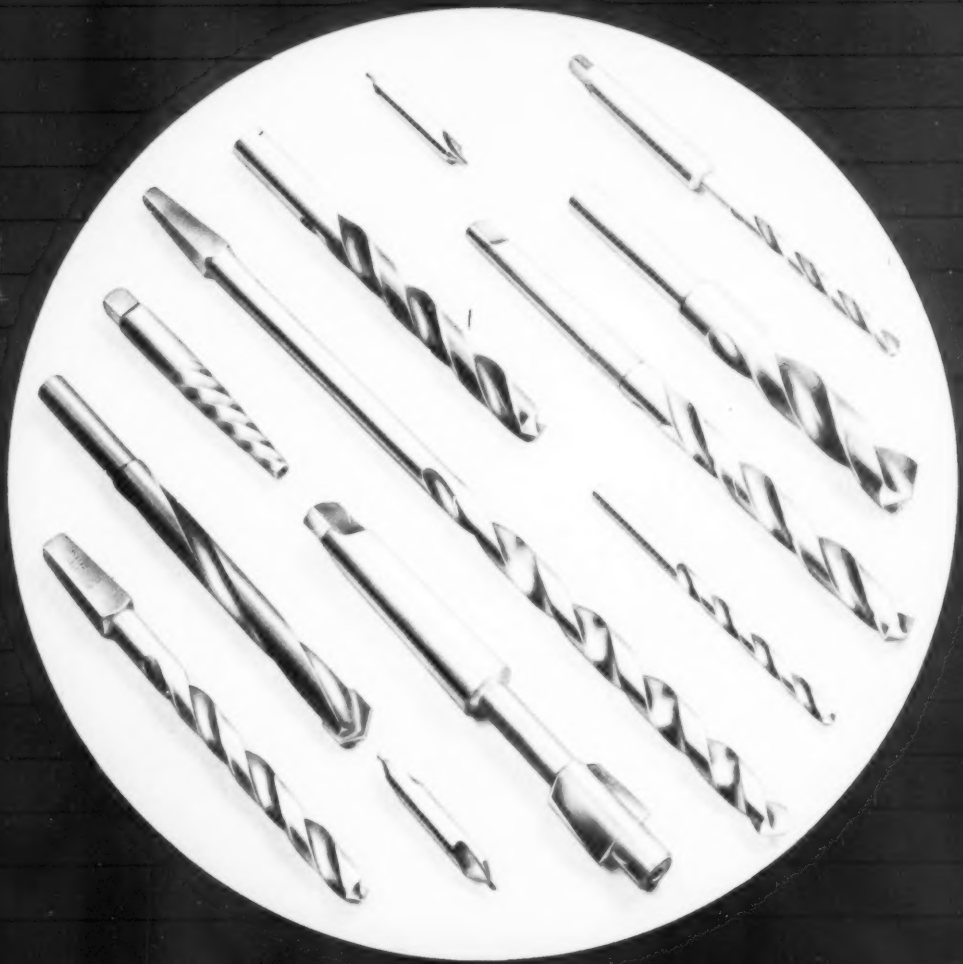
months to keep the book up to date, and would be extremely useful to production and tool engineers, technicians, draftsmen, and scientists.

Often when one has only a vague idea for the solution of a problem, just a hint from the solution of a somewhat similar problem is sufficient to start one off on the right track. Such hints could be obtained from the book I suggest.

D. G. Nolle
Wiesbaden, Germany

The cost of publishing such a book would be prohibitive, in the form suggested. However, a book of "Practical Ideas," culled from AM, has been published and is available from McGraw-Hill Book Co.—ED.

Threadwell DRILLS



THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

HSS DRILLING SPEEDS & FEEDS for Various Materials

For Carbon Drills use 40% to 50% of speeds indicated

MATERIAL	SPEED IN FEET PER MIN.	DRILL DIAMETER								
		1/16 TO 1/8	5/32 TO 1/4	9/32 TO 3/8	13/32 TO 1/2	17/32 TO 3/4	25/32 TO 1	1 1/32 TO 1 1/4	1 9/32 TO 1 1/2	1 1/2 AND LARGER
		FEED PER REVOLUTION INCHES								
Aluminum	250 TO 300	.002 TO .003	.003 TO .005	.005 TO .006	.006 TO .008	.008 TO .010	.010 TO .013	.013 TO .015	.015 TO .016	.016 TO .018
Brass or Bronze	150 TO 200	.002 TO .004	.004 TO .007	.007 TO .010	.010 TO .014	.014 TO .018	.016 TO .022	.020 TO .026	.026 TO .030	.030 TO .040
Forgings: Alloy Steel	60 TO 75	.002 TO .003	.003 TO .004	.004 TO .006	.006 TO .009	.008 TO .012	.010 TO .014	.012 TO .016	.014 TO .020	.016 TO .026
Forgings: Alloy Steel Heat Treated	45 TO 60	.002 TO .003	.003 TO .004	.004 TO .005	.005 TO .006	.007 TO .010	.009 TO .012	.010 TO .014	.012 TO .016	.014 TO .022
Iron: Cast Malleable	75 TO 110	.002 TO .004	.004 TO .006	.006 TO .009	.009 TO .012	.012 TO .016	.014 TO .020	.018 TO .025	.022 TO .028	.022 TO .030
Monel Metal	60 TO 75	.002 TO .003	.003 TO .004	.004 TO .006	.006 TO .009	.008 TO .012	.010 TO .014	.012 TO .016	.014 TO .020	.016 TO .026
Steel: Carbon .2 to .3	70 TO 95	.002 TO .003	.003 TO .005	.005 TO .007	.006 TO .010	.010 TO .014	.014 TO .016	.016 TO .022	.018 TO .025	.020 TO .028
Steel: Cast Nickel, 3 1/2%	60 TO 75	.002 TO .003	.003 TO .005	.004 TO .006	.006 TO .010	.010 TO .014	.014 TO .016	.016 TO .022	.018 TO .025	.020 TO .028
Steel: Molybdenum Stainless Tool	60 TO 75	.002 TO .003	.003 TO .004	.004 TO .006	.006 TO .009	.008 TO .012	.010 TO .014	.012 TO .016	.014 TO .020	.016 TO .026

CARBIDE DRILLING SPEEDS IN SURFACE FEET PER MIN.

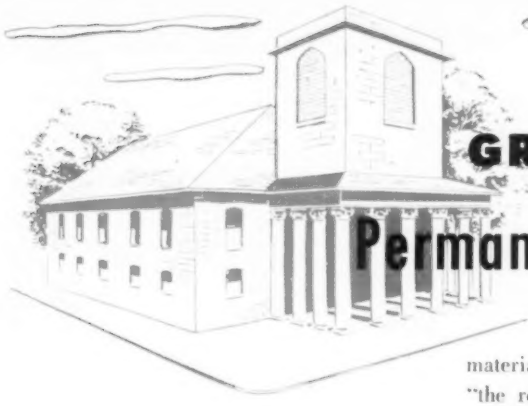
MATERIAL	Drill Diam.	Speed	MATERIAL	Drill Diam.	Speed
Non-ferrous Alloys	....	150	Glass	....	20
Cast Iron (Soft)	1/8 to 7/16	70	Steel (Over 375 Brinell)	....	100
Cast Iron (Soft)	9/16 to 1	85	Plastic (Phenolic, etc.)	....	100
Cast Iron (Soft)	1 or more	125	Plastic (Glass Bonded)	....	50
Cast Iron (Chilled)	....	30	Wood	....	200

Threadwell

Threadwell Tools do many jobs

they can do your tough ones

THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.



GRANITE . . . for Permanent Precision

The stately beauty of King's Chapel, built in 1749-54, is still evident in the enduring granite structure standing at School and Tremont Streets, Boston. At that time, it was considered the greatest construction project of its type ever undertaken.

The thrifty pioneers who settled New England in the 17th century recognized the value of granite as a permanent building material. An early Boston law prohibited "the removal of boulders from the commons or undivided lands without a license from the committee." . . . penalty for violation was "the forfeiture of ten shillings for each cartload so dug and carried away."

Today, granite is recognized equally for its value as a basic material for permanently precise surface plates. A non-critical material, granite provides freedom from rust, warp and corrosion, unmatched hardness, ageless permanence, plus the absolute accuracy required for precision quality control.

for precision measurement operations GRANITE SURFACE PLATES

non-magnetic

unaffected by average temperatures

tolerances to 50/1,000,000-inch

produced by nature . . . perfected by

The Herman Stone Co.

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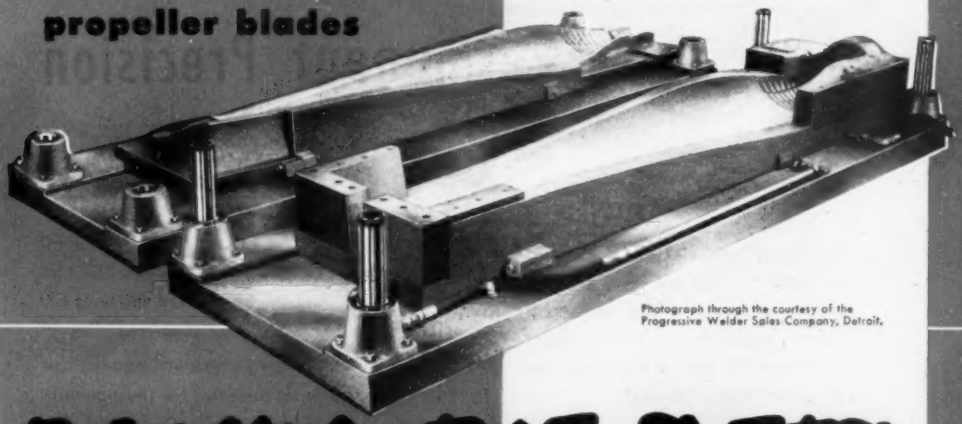
HOT FORMING

aircraft propeller blades

This unique new process takes a previously hot-worked billet and hot forms it into a one-piece hollow steel aircraft propeller. Now, in three steps requiring only a few minutes, a superior propeller is produced that formerly required hours of work.

The development gave rise to the problem of building a special 15 ton die that would provide a quenching action from 1450 degrees in a five minute press cycle.

For a die like this, the diemakers called for . . .



Photograph through the courtesy of the Progressive Welder Sales Company, Detroit.

DANLY DIE SETS

Reliable Danly precision plus unmatched facilities for the production of standard or special die sets like the one shown here make Danly Die Sets the first choice of diemakers everywhere. A nation-wide system of branch assembly plants* assures prompt, time saving service.

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*CHICAGO 50, 2100 South Laramie Avenue
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*DETROIT 16, 1549 Temple Avenue
*GRAND RAPIDS, 113 Michigan Street N.W.
INDIANAPOLIS 4, 5 West 10th Street
*LONG ISLAND CITY 1, 47-28 37th Street
*LOS ANGELES 54, Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2, 111 East Wisconsin Avenue
PHILADELPHIA 44, 18 West Chelten Avenue
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*Indicates complete stock

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MORE THAN 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

SPOT NEWS of Metalworking

- **Ford's new engine plant in Cleveland** will have some 50 or more transfer-type machines tied together with an array of Ford-developed automation equipment that all but eliminates manual labor.

- **Bridgeport Brass Co. will add aluminum** to its line of brass and copper products. No extensive alteration of plant or equipment is necessary to carry out this plan. During World War II a number of European brass and copper mills entered successfully the aluminum field.

- **Dual-purpose plants should be established as permanent defense policy.** General Motors President C. E. Wilson proposed at annual meeting of American Ordnance Association in Cincinnati. Plants could be used in three ways: for combined civilian and defense production, for total war production, or for total civilian production. Mr. Wilson illustrated his plan with a plant layout for making jet engines and auto-body stampings under the same roof.

One turret-lathe builder has been training operators at a cost of $1700 each, only to lose many of them to big local munitions plants. One operator so trained, who a year ago had never worked at a machine, is now foreman of a turret-lathe department at a tank plant.

- **The automobile industry is likely to produce 4-million passenger cars** and at least 1-million trucks in 1952, L. W. Smead, general sales manager, Ford Div., Ford Motor Co., estimates. That would put 1952 among the five biggest years in history.

- **Foreign machine tools imported into this country** may soon be brought under NPA's order M-41 which now controls distribution of machine tools built here. NPA is known to be studying the problem. Up to now any machine-tool user has been able to buy any foreign machine tool that he wishes without restrictions.

- **Average foreman's pay in 106 companies in Cleveland area is $426 a month,** according to survey by Associated Industries of Cleveland. It was $382.37 a month in 1949. Biggest increase in past two years has gone to Class C foremen, whose average pay is $371, up over 1949. These men supervise an average of 22 men, punch a time clock, are paid overtime, get paid an hourly rate. Class A foremen, some with superintendent's rank, are getting average of $540.

Chevrolet is negotiating to buy 162 radial drills in Italy on the strength of delivery to its Buffalo, N. Y., jet-engine plant within 120 days.

- **Caterpillar Tractor Co. strike,** ended October 1, resulted in loss in sales of $75 million during two months workers were out, according to a projected estimate. More than 22,000 production employees were idle during the strike. The agreement with CIO-UAW Local 974 provides for an across-the-board increase of 13½ cents per hour, plus cost-of-living wage adjustment next February.

- **Fisher Body will build Bullard Cut Master vertical turret lathes under subcontract.** Fisher Body's Pittsburgh plant will serve as assembly point for the Bullard production. Fabrication will be in Fisher Body toolroom facilities in seven plants in five cities: Pittsburgh, Cleveland, Hamilton, Flint plant No. 1, and Detroit plants 21, 23 and Fleetwood. Expected maximum output: 50 units a month. Bullard has also subcontracted its entire production of the 30 x 20-in. line of Spacer tables to Walter Scott, Inc., printing press manufacturer, and the 34-in. 4-spindle Type D Mult-Au-Matic to York Corp., York, Pa.

- **Ford Motor Co. will spend over $13 million** to expand production plants of its subsidiary in Australia. Present productive capacity will be doubled. New manufacturing operations will include casting and machining of V8 engine blocks, cylinder heads, crankshafts, camshafts, etc.

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Blade Machining Equipment

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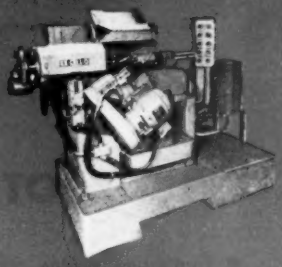
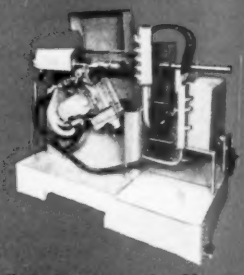
Compressor blade for turbojet aircraft engine.

XLO

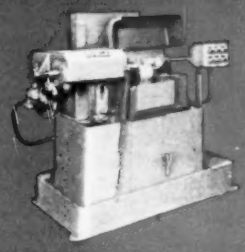
Three Production-Proved Machines Mill, Grind and Polish Airfoil Forms



Ex-Cell-O Precision Profile Miller, Style 86, mills the complete airfoil form including leading and trailing edges. Work is supported rigidly by back rests throughout the cutting stroke.



Ex-Cell-O Precision Profile Grinder, Style 87, grinds the complete airfoil form including leading and trailing edges. Work speeds change automatically during rotation as area of contact between wheel and work varies.



Ex-Cell-O Precision Profile Polisher, Style 88, polishes the airfoil form with an abrasive belt which passes over a rubber pulley at point of work contact.

The complex job of finishing the airfoil form of compressor blades for jet aircraft engines is now done speedily, accurately, and automatically by three Ex-Cell-O standard machines. Production-proved, these machines mill, grind, and polish, respectively, with completely automatic machining cycles. Operator merely loads, unloads, and pushes start button. For further information and specifications contact Ex-Cell-O in Detroit today.

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Washington

Expansion of the Armed Forces will mean extension of controls—perhaps for a year longer than anticipated. It depends on how much Congress permits the services to grow.

• • •

Scale of the increase will be set next year. It will take Congress that long to get around to it. But you can expect a minimum strength increase of 500,000 men—from 3.5-million to a total of 4-million men.

Most additional equipment will go to Air Force. It will be boosted to at least 138 wings, from the presently authorized 95 wings. Army and Navy will get much smaller increases.

• • •

Total cost of such expansion runs to $15-billion. Most of that would be for hard goods, largely aircraft. Chiefs of Staff want the money next year but wouldn't spend it all before 1954.

That would mean $50-billion military budget next year—fiscal 1953. Without boost, budget was in for cut to about $35-billion.

• • •

Most of increase will come after 1953, at end of presently scheduled build-up. It can't be put atop present program. The services couldn't get the orders out that fast, and industry would be hard-pressed to carry the added load.

So military production will hit peak in late '53—instead of earlier that year. Some production will rise earlier; more will slop over into 1954.

• • •

Services will have to find more aircraft engines. Present production won't be enough. That may mean conversion of auto plants.

More aluminum will be needed, too. Builders of airframes can spread out facilities, but they will need more metal—and more tools, too.

• • •

Not much new plant will be asked. Except for engines. The Military figures plant now built or building can handle bigger aircraft program. But all plant will have to operate, instead of going into reserve status as planned.

Structural steel shortage bars plant expansion beyond present schedules, anyhow. That's why services are looking for other industries to help build engines.

• • •

Further cuts in civilian production will come, perhaps before the new military program. We already are running shorter on aluminum and copper than anyone anticipated.

Washington will try to stop non-essential uses—copper ash trays, aluminum blinds—again. NPA tried it last spring, had to give in to small business, Congressional protests.

Mobilizer Wilson hopes to stop there—with no more materials cuts for consumer goods. But other controllers think that's just wishful thinking. Even without expansion, military demand for materials will go up another 25% before the end of next year.

Decision on consumer goods will come in December—in time to fix allotments for second quarter of 1952. First-quarter allotments are already set at about October-December levels.

• • •

Military manpower is another headache. The Army needs more men now, to replace casualties in Korea and to release reservists. Casualties are much heavier than you'd think from lists being released piecemeal by the services.

So draft calls will go up. They're taking about 55,000 men a month now. They'll go back to 80,000, or higher, by winter.

• • •

We'll get no more copper imports out of the new International Allocation Agreement. Our cut amounts to less than last year's total, a bit more than the present rate. But there's no price agreement, and foreign users can still bid over the U.S. ceiling of 27.5 cents.

• • •

Congress may investigate Detroit. House Armed Services Committee has heard rumors of auto industry finagling on military orders for components. It will call hearings after Congress adjourns.

• • •

Union shop elections headed for the discard after the House Labor Committee approved the Taft-Humphrey Bill passed by the Senate. House approval seemed routine.

This would be the first change in the 1947 Taft-Hartley Labor Law. Significantly, both friends and foes of the law backed it, whereas labor was split. Only the CIO is hot for it.

• • •

More defense-industry strikes headed for the Wage Stabilization Board as employer resistance to exorbitant wage increases stiffened. WSB is getting ready to handle them.

It looked, at presstime, as if the long strikes at Douglas Aircraft and Brown & Sharpe would wind up at WSB unless settled soon.

• • •

What keeps the stabilizers worried most, however, is steel. The reasons: the defense effort can't stand a big steel strike, and the stabilization program can't digest a big wage-price rise in steel without serious after effects.

Stabilizer Johnston recognizes that in the steel negotiations stabilization faces its most critical test. Prospect is for a sizeable wage increase around 10 cents an hour and some price rise. About Jan. 1.

Average diameter of a hole
Bearing race matching
Angle between bore and face
Diameter
Thickness
Bore center distance
Crank throw, eliminating all error due to diametral tolerance
Twist
Bend
Lobing or cloverleaf of a centerless ground shaft
Typical Dimensions and Relationships measured with Sheffield
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SHEFFIELD
Internal radial clearance
Flatness
Distance between hole centers eliminating all error caused by diametral tolerance
Center distance of incomplete holes eliminating all error caused by diametral tolerance

Detroit

Pressure is being felt in Detroit in many ways for higher wages for skilled men. Local unions are crying about it. Producers have been canvassed by members of a WSB study committee on tool and die wages; the laborites on this panel (and apparently the public members, too) seem to feel that higher pay rates would solve a lot of problems.

Management people retort that you can't find more toolmakers by raising rates — that nothing happens except accelerated movement from shop to shop. The company viewpoint is that if existing WSB regulations were properly applied and extended, no special rules would be necessary for craftsmen.

But, if higher rates are authorized for the craftsmen, then the maintenance people will want them, and the movement will trickle right down the line. For that reason larger companies as well as shops are highly concerned with the study committee's report.

• • •

Shops around Detroit are still heavily loaded, for the time being. Machine tool backlogs seem to be enlarging. Tool and die orders are keeping work close to capacity, and will till the end of the year, when the automotive programs get out of the shops. Once that happens the die producers may face a somewhat subdued winter, but jig and fixture shops are getting enough work that they won't slump off.

• • •

New models are not far away. Chrysler will show its 1952 wares at a private unveiling early in November; Packard and Hudson will likely come along about the same time. Public announcements will follow shortly. Plenty of toolwork is still in the shops—General Motors and Ford divisions will not show on that account till late this year or early in 1952.

• • •

There's lots of talk in the wind about extensions of power steering; that may mean tooling ahead. Gemmer is the large producer today, building for Chrysler. But Chrysler wants more than Gemmer can furnish, and is working on some designs of its own.

General Motors, reportedly ready to introduce power steering on larger 1952 models, will likely do so as far as production facilities permit.

Down at Lafayette, Ind., Ross Gear is building hydraulic-powered steering gear assists for military vehicles, and might get into the civilian applications.

• • •

On the score of 1952 model innovations, the industry chewed over with high interest the news from Bendix that it had developed a power-assisted brake which would find use in one 1952 model, probably a GM division. So far as can be gathered, it's a pedal with about the same travel as an accelerator, doing enough work in that span to equal normal brake effect.

You might look forward to the day when you'll drive your car with two treadles, a gas feed for your right foot, a brake for your left. Or maybe even only one, like a rocker—press the toe for speed, the heel for brake.

• • •

Fourth quarter allocations for auto companies are resulting in somewhat lower production schedules. The first October week saw activity at a rate calculated to produce around 115,000 assemblies; that's well under third quarter weekly averages.

Those allocations are still being juggled; the smaller firms may get a few additional cars on their quotas at the expense of the big fellows.

Washington has privately advised the auto companies they can expect further allocation declines during the first 1952 quarter—probably 5% to 10% below the fourth 1951 quarter. There's nothing final yet, though.

• • •

In company with the lowered output, employment is down. Detroit payrolls, however, are not expected to drift very far below their present levels. Today's total employment is figured about 50,000 below the April peak this year—3.5% or so. USES estimates that about 90,000 people are job seeking—about 8% of payroll.

• • •

Employment would be considerably stabilized under a notable suggestion by C. E. Wilson, GM president, for a permanent national defense program. Wilson's idea: integrated, dual-purpose plants.

The plants would be laid out for combined military and civilian production, all-out war output, or all-out civilian output. Common sections of the plants would be employed for any of the three pursuits. Special sections would be used for specific civilian or military assignments, as desired.

• • •

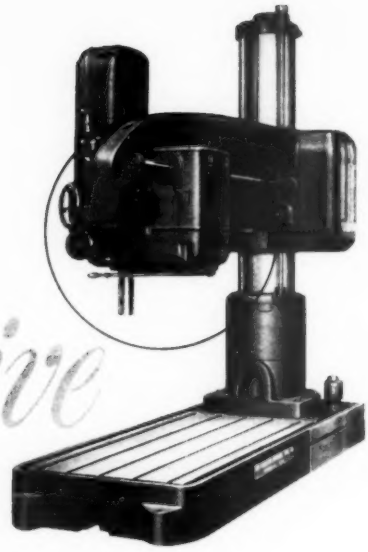
Company notes: Chevrolet will be in the market for another big batch of machine tools, for a new aircraft engine plant to go up in Flint. The million-foot area will be employed in tandem with the recently announced plant of similar size at Buffalo.

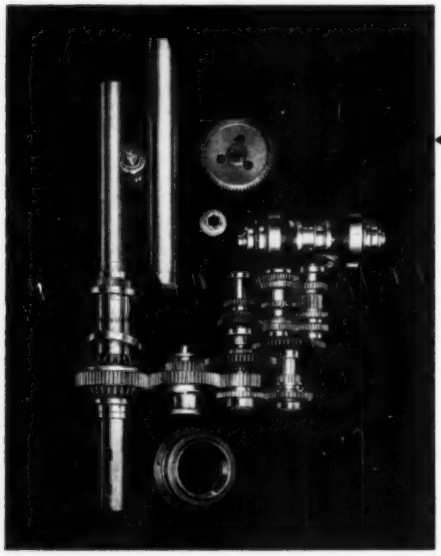
Parts output for these assembly and manufacturing plants has already begun. Chevrolet facilities in Flint, Buffalo, Detroit, Bay City, Cleveland, Saginaw, and Muncie have been assigned bits and pieces on the job.

comparison proves Carlton's

low hung drive

is without comparison





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Machine Tools

The machine tool industry is facing this kind of production problem: The foreseeable orders which will have been placed with builders for defense work since Korea should total around $3 billion by end of government's fiscal year next June 30.

But that figure is not all-inclusive. It does not count in a big program for certain types of weapons. This program alone should add another $500 million.

Instead of the over-all program's shrinking, the feeling in Washington is that it will expand.

• • •

The full meaning of these calculations is that the machine tool industry has a herculean job ahead. What it will be able to do, in realistic terms, comes out about like this:

Production this year will be around $675 million. Output should be pushed up, by end of first half of 1952 or earlier, to a $1.2 billion-a-year rate, or better. A production rate of $1.4 billion is probable.

Washington feels that machine tool builders will have their hands full at least until the end of 1953. There will be exceptions, in the case of individual builders. But the industry, on the whole, will be up to its ears until then.

• • •

Builders must find 25,000 more skilled men, or their equivalent in subcontracting, to get their defense job done.

Employment is so tight, that chances of getting 25,000 men are slim. Subcontracting then is to be the chief recourse.

Washington will turn the heat on industries with equipment and workers closely parallel to the machine tool industry, to make machine tools.

Best prospects: makers of textile machinery, printing presses, paper-mill machinery, and the like.

• • •

Fisher Body will do a huge subcontracting job for Bullard. But aside from this one spectacular case, the big talk about enormous help from the automotive industry in building machine tools is little more than talk. As one automotive expert said, "You could put all the tool rooms in the auto industry in one place and they would not make as large a shop and not nearly as many machine tools as (a prominent machine tool builder)."

The fact is that CIO-UAW's Walter Reuther proposed a plan for the automobile industry to produce machine tools or components thereof. It was submitted direct to the President; and politically it got more attention than it deserved on its merits.

NPA held meetings about it to which automobile executives were called. These officials pledged their aid if possible. But the truth is that this is not the way to get more machine tools produced. And Detroit executives know it, but do not say so.

• • •

Materials are just as much a headache as manpower. The DX super-priority is a noble idea, but it is not as potent as expected. It takes too long to get it to work in an emergency.

NPA's steel people are telling the steel mills to give machine tool builders what they need. Forget about historical pattern. If builders must have six times what they got pre-Korea, see that they get it.

• • •

Pool orders are being accepted in large numbers by machine tool builders for the first time. The total of signed pool contracts is reported in excess of $500 million, a sharp rise in the past two weeks.

These contracts have the merit of guaranteeing the builder against loss in case of cancellation. They also make available to him 30% of the order in cash, in installments.

But most builders are not asking for the 30%, in view of the terms, including 4% interest, which are attached to it. They are apparently going to local banking sources for working capital, but in some cases are using the pool contracts as a form of collateral, the contracts being backed up by GSA.

• • •

The British are believed to have made protests through diplomatic channels against U.S. defense contractors going into western Germany and placing machine tool orders in competition with the British themselves, who already have large orders on books of German builders. London is fearful that delivery schedules to Britain will be disrupted and British defense program be set back.

• • •

P. L. Houser, who has been deputy director of the Metalworking Equipment Division of the National Production Authority, has returned to International Harvester Co. after having served in Washington since the beginning of the current defense program.

• • •

Foreign machine-tool builders are making fancy delivery promises to prospective U. S. defense customers. Sample: Italian company says it can begin delivery of 60 boring mills next June and complete delivery in August.

It is no secret that Italian makers have been building machine tools for stock. U. S. shortage represents their golden opportunity to unload.

If broaching isn't the answer, we'll tell you, too.....

The fact that broaching accurately removes metal faster than any other process does not make it a panacea to increase the productivity of ANY operation.

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They have learned the hard way that the wrong broach, fixture or machine—even if it costs a few dollars less—is poor economy. It costs more in the long run, cuts productivity.

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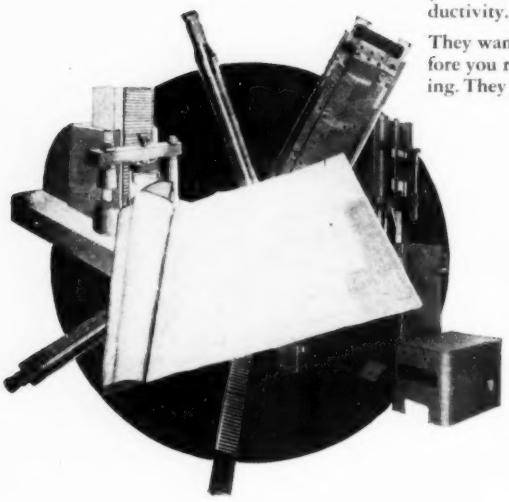

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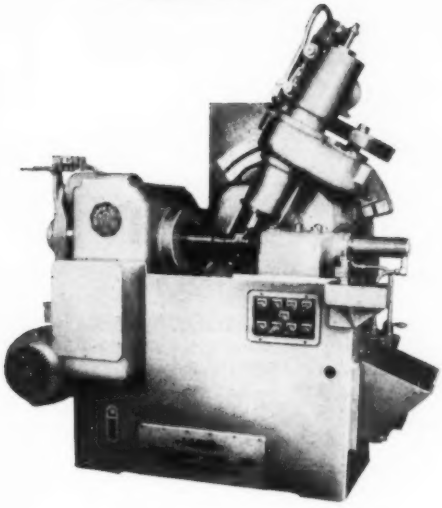
Available in 4 sizes, for gears and splines up to 3 in., 5 in., 7 in. and 10 in. diameter, respectively.

The Fastest Single Spindle Gear Hobber



The new Michigan Single Spindle Gear Hobber closely approaches the Shear-Speed in its output rate. It is ideally suited to helical as well as spur gears and splines up to 8" diam. and 5" face.

It will cut two 3" diam. 1" face gears to well within pre-shave tolerances in 58 seconds.

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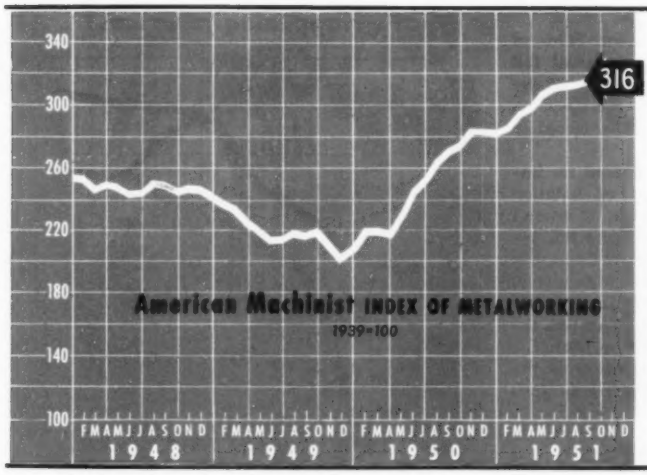
Gaging Metalworking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1949
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1951

INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '51	AUG '51(p)	JULY '51(r)	AUG '50
	316*	312	311	279
Machinery	304	310	251	
Electrical Manufacturing	346	342	321	
Automobiles, Trucks	217	220	264	
Transportation Equipment	448	433	279	
Other Metalworking	309	317	303	

* Estimated (p) Preliminary (r) Revised

Consumer Output Faces Tighter Squeeze

Metalworking is rapidly approaching the time when the squeeze on production of civilian goods will be the greatest. The amount of steel, copper and aluminum at hand will be the true measure of how far down output for the civilian economy must go.

And it now appears that the peak demand for these metals for defense work will be in the summer of 1952. Demand from defense contracts will stay sky-high during the last half of 1952.

• • •

Then there will be a leveling off onto a high plateau throughout 1953. This does not mean that the peak of defense production will be attained by mid-1952.

Metals demand will reach that peak earlier than actual manufacture of defense goods because of the lead time involved. Top output of tanks and planes and guns will not come until late next year or the first half of 1953.

• • •

Tooling up and actual production of major defense items are being retarded by the understandable reluctance of the military high command to freeze designs. If designs were frozen, that would give the green light to the making of thousands of units which soon might become obsolete.

Arms production gradually is growing, however. It will continue to expand and will pick up speed as machine tools become available in large numbers. It will more than offset the drop in civilian goods output.

American Machinist Index of Metalworking production should continue to rise. Plates, shapes and bars are causing the most trouble in steel.

Some of the load on plate mills is being taken by strip mills. And that spells less strip and sheet tonnage. Job of enlarging shape tonnage is tougher. Hot bar steel of top quality is a problem.

• • •

Washington is making a gallant effort to down-rate alloy content of alloy steels, but is only partially successful. Nickel provides more headaches than almost anything else in the alloy field. Copper people will be doing amazingly well if they can provide as much tonnage in 1952 as this year, and remember that the supply this year is less than in 1950.

All copper "in the pipeline" was used up last year. Drawing upon the government's stockpile is about at an end, as Washington is nervous about depleting its stocks further. From now on, the only copper available will come from current domestic output and from imports.

• • •

NPA officials say that aluminum is a good bet as a long term substitute for copper, the outlook for which is very dim. But for the short-term, aluminum is in a worse spot than copper.

No one counted on reduced output resulting from the greatest drought in 20 years in the Northwest. What's more the aluminum pipeline has nothing in it. On the cheerful side is the fact that the aluminum expansion program should be completed by the second quarter of '52.

Gaging Business

Business is picking up right across the board. Inventories have been worked down. Sales of consumer goods are starting their usual fall spurt. Buying on credit is pushing toward the $15-billion mark. During August there was an increase of $155 million in installment buying.

• • •

What will happen to prices still remains an important issue. Is another spurt of inflation around the corner? At this point, it doesn't look like we are in for as much as a 5% increase in the next year. The cost of living has leveled off since May at about 9% higher than pre-Korea. For the balance of this year, retail prices may rise one or two points, on the average, to about 187 (1935-1939 = 100).

Wholesale prices have declined six points from the March peak of 184 (1926 = 100) to about 13% above pre-Korean prices.

• • •

Employment in durable goods manufacturing industries in August totaled 8.9 million workers, nearly 600,000 above August 1950. Most of this gain was in non-production workers. Increase in production workers was only about 375,000.

• • •

Steel importers are being swamped by fabricators. Forging bars, heavy plate, structurals and sheet are in heaviest demand, in about that order. Selling is direct to customers to defeat black-market operations.

But supply of imported steel is being reduced. To keep up the supply, some US steel importers are shipping thousands of tons of coal to Germany as barter for steel.

• • •

Conditions are bettering all the time for the screw machine products industry. Both new orders and shipments have been on the upswing since June 1950.

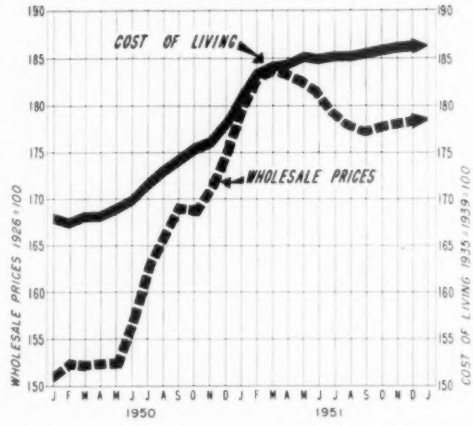
About 46% of the industry's production is now going to the armament and armament-related program. The industry still has open capacity.

• • •

The stamping industry has plenty of open capacity at present. August backlog was down 3% from July. August automotive shipments were up 27% over July, military shipments up 20% over July and all other shipments were 47% higher than in July.

At the same time, new orders from the automotive industry were off 54% in August from July, military new orders were down 59% from July, while new orders from all others were up 25%.

What's Happening to Prices?



WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	230.7	230.1	224.4
Steel ingot production (thousands of tons)	2,051	2,041	1,952
Electric power output (million kilowatt hours)	7,102	7,014	6,503
Production of automobiles and trucks	115,319	135,015	187,030
Engineering construction awards (*Engineering News Record*, millions)	$421.9	$335.1	$288.0

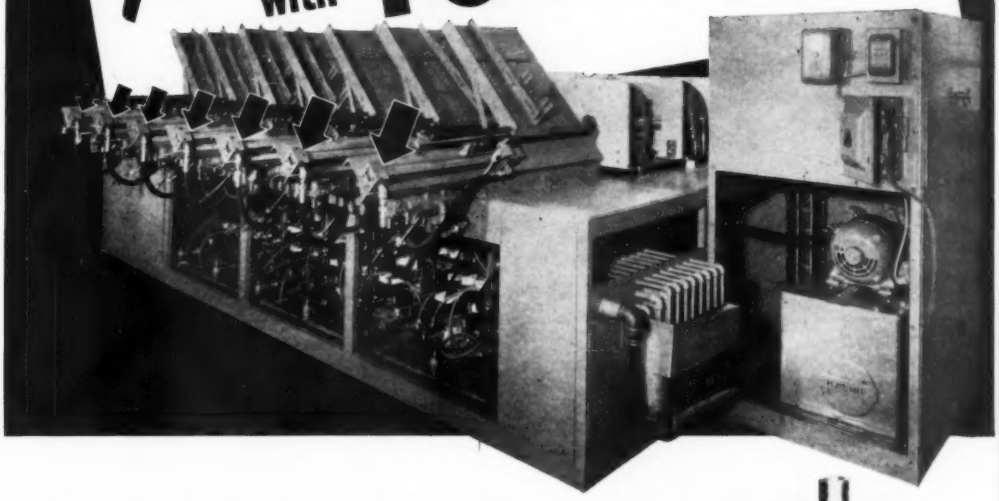
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators, sales (thousands of units)	188	200	518
Vacuum cleaners, sales (thousands of units)	191	161	341
Washers, sales (thousands of units)	239	140	381
Household electric ranges, sales (thousands of units)	65	63	132
Radio production (thousands of units)	563	540	1,204
Television production (thousands of units)	147	152	721
Gear sales index (1935-1939 = 100)	564.2	589.1	617.4
Foundry equipment, new orders index (shipments 1937-1939 = 100)	404.5	390.3	693.6

* Seasonally adjusted.

Job File No. 3259

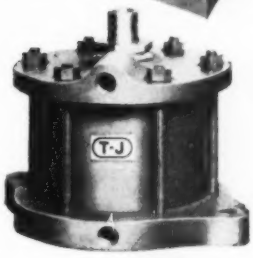
Feeds Automatically with T-J CYLINDERS



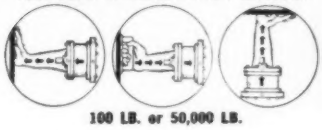
T-J Hydraulic Cylinders furnish efficient, automatic "push power" for feeding devices in this new Ajax-Northrup induction forge heating equipment.

This unit—manufactured by Ajax Electrothermic Corp., Trenton, N. J.—automatically heats steel forging stock in sizes ranging from 1 to 4 inches (rounds or squares) at 2250°F. at rate of 7500 to 8500 lbs. per hour. Has space for 8 heating stations . . . each with *hydraulically operated billet feeding devices employing T-J Cylinders.* These cylinders also eject heated bars automatically. Induction heating with this equipment results in uniformity of successive billets fed to the forge—thus controlling quality of finished forgings and reducing rejects.

Do you have a tough job in power movement—pushing, pulling or lifting? Let T-J help you *simplify machines, save labor* and *cut costs* by using T-J Air or Hydraulic Cylinders! Many standard sizes and styles . . . cushioned or non-cushioned . . . 100 lb. or 50,000 lb. Precision-built, long life. Write for more information. The Tomkins-Johnson Co., Jackson, Mich.



FOR POWER MOVEMENT IN ANY DIRECTION



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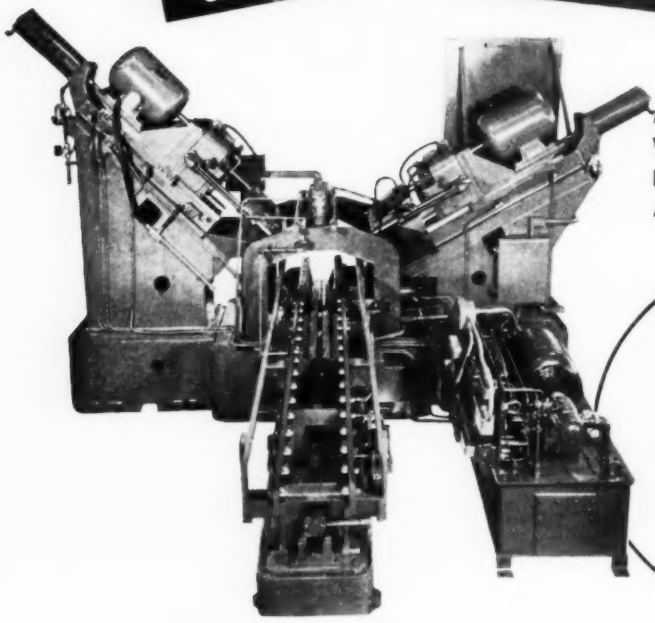
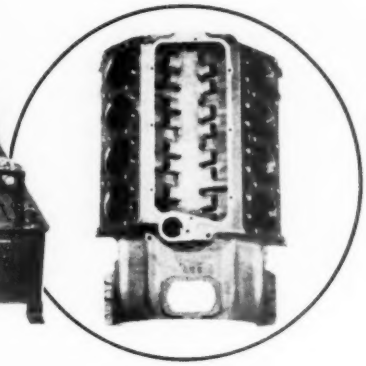
RIVETORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

T-J

Engine Production Problem "GETS THE BRUSH!"



MORRIS *Mor-Speed* MACHINE WIRE BRUSHES CYLINDER BORES and TAPPET HOLES AUTOMATICALLY . . . .



"Untouched by human hands," this massive V-8 engine block is automatically loaded, clamped, wire brushed on both banks, then automatically unloaded to the production conveyor.

Installed in the plant of a leading auto manufacturer, this Morris Production Machine speeds the production of a new super-powered engine. In the view shown here, the left hand hydraulically operated angular slide carries four wire brushes for the cylinder bores. The other angular slide carries eight brushes for the tappet holes. Automatic 180° indexing allows alternate brushing of both cylinder banks.

This machine illustrates the versatility of Morris Engineers in applying production methods to time and labor consuming jobs. If your work requires numerous operations on a mass production basis, your inquiry is invited. No obligation.

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"A better product at less cost— with MORRIS **PRECISION** *plus* **PRODUCTION"**

Builders of MOR-SPEED Line

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

At Stake: Your Own Steel Supply

An alert steel warehouse company has named its 70 salesmen "official scrap sleuths."

They have their own technique for uncovering scrap around a plant. They seek permission to go through the shop, accompanied by a company official and a production engineer.

The theory is that these "sleuths" will see scrap that the company's management, even the foremen, will pass by and not recognize as scrap, though it is in full view of everybody.

THIS TECHNIQUE is getting results. One of the "sleuths" turned up 45 tons of obsolete tools and machines during an afternoon's visit to one Cleveland plant.

Another came up with three truckloads of scrap in a Toledo plant noted for its good housekeeping. And other "sleuths" have accomplished comparable results.

No attempt is made to look for production scrap. So-called dormant scrap—old castings, tools, machines—is the sole interest. And there is lots of it around.

The management of the steel warehouse company is dangling some attractive bait in front of its "sleuths." The one who digs up the most scrap in October and November will get a two-week vacation in Florida this winter with all expenses paid for himself and his wife.

This steel warehouse company, which incidentally does not buy a pound of scrap itself, is using a practical means for helping solve the most critical iron and steel scrap situation that has ever faced the nation.

THE SHORTAGE of steel promises to stay with us for some time. Washington is putting pressure on steel mills to get out the maximum tonnage in the months ahead. New steel-making facilities are being rushed to completion.

Yet never has the stockpile of scrap, so vital to steel production, been so low. Summer is the time when scrap is accumulated for the winter season. But this year steel production was so high that mills had no chance to build their scrap stocks.

This means "touch-and-go" in iron and steel scrap for months ahead. All possible sources of scrap must be thoroughly combed.

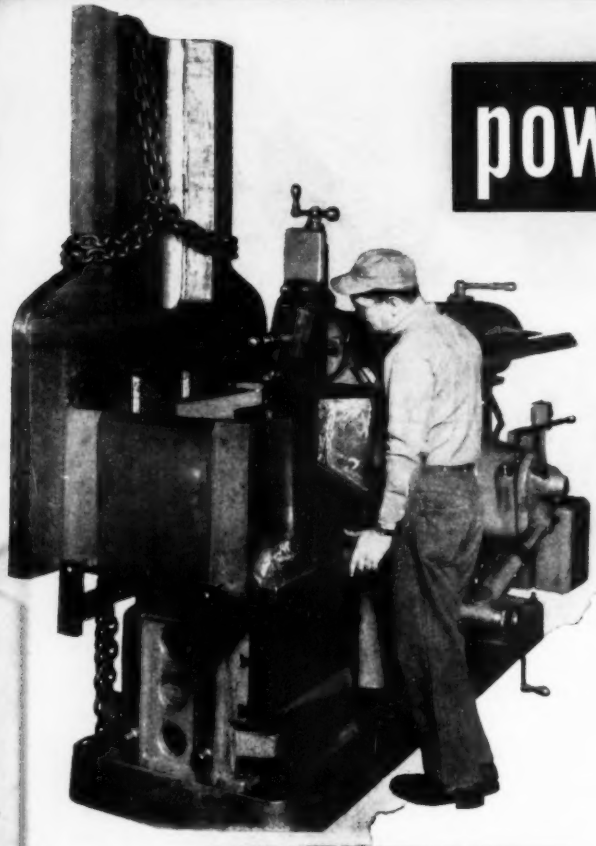
The tonnage of production scrap will not be enough. Scrap now put to one side, perhaps not thought of as scrap, should be gotten out and put to work.

Search your shop now to turn up much-needed dormant scrap. And then sell the scrap without delay to the nearest dealer.

REMEMBER that you cannot afford to sit on the sidelines during this campaign. Your own tonnage of steel may well depend upon how good a scrap job you do now.

Burnham Finney

powerful!



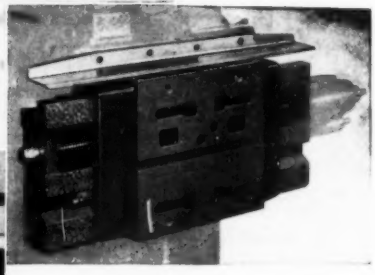
Jobs like this 5300# weldment are easy on a Cincinnati

Cincinnati Shapers are powerful and dependable...

Cincinnati Shapers handle very heavy work—are powerful metal removers. They are dependable and trouble free on the most demanding jobs.

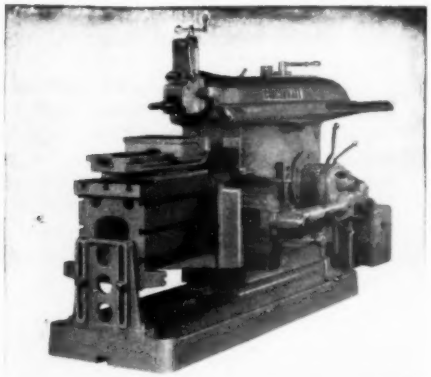
The extra long feed of the Cincinnati tool slide gives the needed range to shape the long blind hole of this large weldment. Dovetailed tool slide and accurately gibbed ram, with extended bearings, prevent chatter under these severe conditions. Table feed and power rapid traverse operate smoothly even with this 5300-lb. load.

Cincinnati Shapers work to close limits and are profitable in both tool room and production departments.



This massive cross rail securely supports the apron on three automatically lubricated bearing surfaces. All controls are at the operator's position. The cross rail is square-locked to the column and automatically lubricated. Alignment is maintained by taper gibs.

This sturdy table support has the sliding action at the table and is gibbed to maintain alignment. Sliding surfaces are completely protected against dirt.



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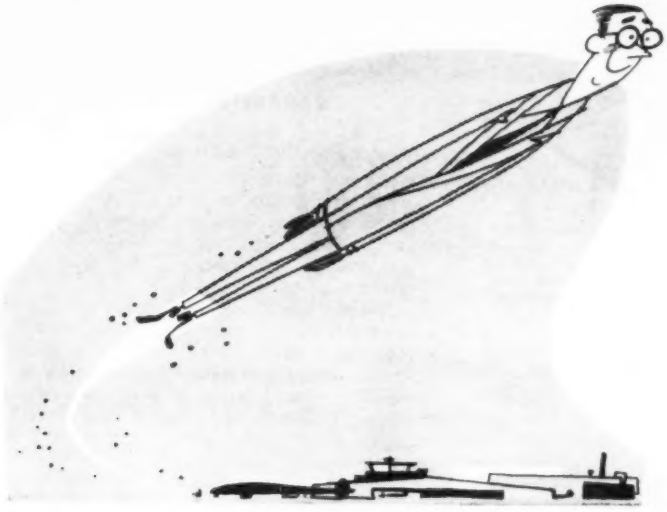


BY H. E. LINSLEY
ASSOCIATE EDITOR

LOCKHEED TRAINS FROM THE TOP

No company can be better than its management.

And as supervision is a key part of management, this company has established a series of training courses to insure a top quality executive and supervisory staff

Working from the premise that the best way to prepare for a highly competitive future is to develop intelligent men and women into a well-informed, far-seeing, cooperative and efficient working force, Lockheed Aircraft Corp has undertaken a training program that extends throughout the entire organization.

Starting at the executive level, men are selected from various parts of the organization who have been found to have the necessary abilities and qualifications for executive positions.

Candidates are selected by a committee which collects and analyzes all available data, plus personal judgments and recommendations from present and former superiors and associates. Each branch of the company is permitted to select a number of trainees equal to its proportionate size and position in the over-all corporation, and each branch committee processes and makes the final selection of its own candidates. Each case is studied individually, and eliminations are made until the list is reduced to five men. Each committeeman then contacts and studies each remaining candidate for a certain period of time, after which a vote is taken and a final choice of one man is made. Specialists from Industrial Relations sit in on the committee meetings as counselors, but have no vote.

To answer the demands of the current defense production, Lockheed has interrupted its executive training program. All trainees, none more than three months from completion of the two-year course, have been given assignments where their training makes them especially valuable now. The regular program will be resumed as soon as conditions warrant.

Starting Times Vary

Selections are made one at a time, and trainees are started in the program on different dates, their selection being made immediately prior to the time of entry. Starting time is at 3- to 6-month intervals, so candidates will complete their courses and be ready for placement in approximately the same sequence. This avoids creation of a difficult placement problem which would occur if too many become eligible at the same time.

The program covers two years of full-time work, including a period of residence work at the Harvard School of Business, and the employee is

". . . residence work at Harvard Business School . . . on full pay"

on full pay for the entire time. The core of the program is that of familiarizing each trainee with the personnel, functions, responsibilities, procedures and problems of all the major operating units of the company, such as engineering, tooling, manufacturing and finance. This is done by physically assigning him to each specified organization for a predetermined time. Assignments are made on the branch level, and from there to the office, division, and department levels, as required by the over-all plan. Before each trainee enters an assigned unit, a complete day-by-day schedule for him must be submitted to, and approved by, the general program committee.

Special Assignments

Along with this familiarization program, each trainee is given certain special assignments for outside work, such as library research, textbook reviews, special surveys, etc. These special assignments, plus a complete written report of the work covered in each operational unit, are turned in to the committee at specified intervals. Where individual needs are so indicated, the trainee is sent to the East Coast to attend the Harvard School of Business for 13 weeks to round out his basic knowledge of business management.

Continuous personal counseling is given each trainee to aid and direct his development, to help him discover his specific weaknesses, and to recommend any specialized types of work he may need.

To supplement their work within the company, trainees are encouraged to contact other companies and industries, and to tour them to further increase their general knowledge of business and industrial organizations and operations.

In addition to these trainees, certain other men are selected from various organizations within the company, but instead of the full two-year executive training program, they are given just the Harvard course and/or other specially selected assignments.

It is expected that this program will provide the company with a group of men thoroughly prepared to take over executive positions as the need occurs in future years.

MANAGEMENT TRAINING

At the next level, a management course for supervisors is still in operation. This includes supervisors and department heads, and the program is designed to familiarize them with over-all company functions and problems, and to give them instruction and practice in conference leadership, public speaking, and the techniques and discussion of human relations problems.

The men are divided into groups of 12 to 15, and are taken off their regular jobs and relieved of all supervisory duties during the training period. The various courses are held in a special classroom in a separate building equipped with the necessary facilities, including audio-visual aids, blackboards, charts, sample parts, and a wire recorder for the public speaking sessions.

Because of the increase in the number of new supervisors as a result of defense expansion, and the greater demands placed on them by the influx of many more relatively inexperienced employees, certain changes have been made in this training program since it was originally planned. Greater emphasis is now placed on the basic requirements of supervision and its practical day-to-day phases, and less attention paid to background. Instead of a full two-week program, the course now takes one week, full time, followed by a year of 1½-hr sessions, once a week.

Basic Course

Subjects in the basic week's course include: employee and labor relations; company policies, procedures and directives; maintaining schedules; planning; wage administration; and cost control. Subjects in the year's followup sessions include lectures by executives on functions of engineeering, scheduling, inspection, legal, and eight other major departments. In discussion groups of 12 to 15, there are 12 weeks on discussion-leading, or conducting, conferences, and thinking on your feet, or oral communication. There are also six-week sessions on report writing, language development, and mathematics review.

Ratings from each man's instructors are used principally for counseling those who show specific weaknesses in certain phases of the program, rather than as a check on what they have learned, or to establish a grade. Group discussion and full participation are emphasized all through the program. Those who do not readily enter the discussion or offer ideas and suggestions are privately counseled on the importance and advantages of doing so, and are given any help or advice needed to obtain the full benefit of the course.

Women, Too

Parallel with this course is a similar one given to salaried staff and supervisory women—a radical departure from standard industrial practice. This

includes executive and administrative secretaries, personnel technicians, staff assistants, and certain other staff jobs. The program calls for about 36 hr to be given in 1½-hr sessions, and consists of a general orientation course on the company and its operations; and a review of secretarial subjects, policies, procedures, and human relations techniques.

The program is planned along the same lines as the management development series, and uses many of the same techniques and speakers. It is considered particularly important because these women carry much of the paper-work load and are in position requiring a rather broad knowledge of company operations, policies and procedures.

ENGINEERING MANAGEMENT

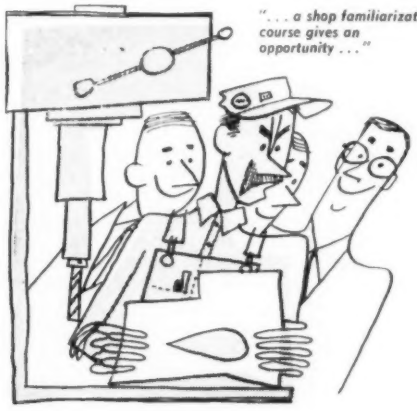
During the war years, the extreme need for technical knowledge and proficiency among engineering personnel tended to place greater emphasis on the technical phase of the engineering supervisor's work. This resulted in a large portion of his administrative functions being delegated to staff agencies.

With the return to more normal operations, these responsibilities were returned to line supervision, and it became evident that there was need for training in the basic techniques of human relations, and in a more general knowledge of all the functions, operations and procedures in engineering, as well as in the other branches of the company.

A full-time, two-week course has therefore been arranged, which is similar in many respects to that given general supervision, except that the emphasis is on the functions of the engineering department.

The program explains the aims, policies, operating procedures, organizational structure, and working relationships of the engineering branch, and develops an awareness of the activities, problems and operations of the various functions in engineering, and in the other departments that affect or are affected by the work of engineering.

It establishes in the mind of the supervisor an awareness of his position as a member of management, and is designed to improve personal relationships between members of engineering supervision on all levels, and also with supervision in other organizations. Human relations, public speaking and conference leadership are also taught, and a sincere effort is made to develop the skill and ability of each man in the most effective use of his capacities, and to stimulate an interest in self-improvement through personal study. The men are encouraged to have personal counseling sessions with the instructors, and may also be counseled on problems relating to their personal development.



". . . a shop familiarization course gives an opportunity . . ."

ENGINEERING INDOCTRINATION

The training courses described above apply to employees already in the company service. For newly hired engineers and draftsmen, an indoctrination course has been prepared. The purpose of this is to familiarize them with the engineering department organization, procedures, practices and standards, and to insure their most efficient assignment within the engineering organization.

New men, and sometimes men transferred from other departments, proceed to the indoctrination center immediately following their company-wide orientation. They are instructed by qualified supervisors from the engineering department, and their time at the center varies with their degree of experience. A former employee, or a transfer, will require only a short brush-up course. A newly graduated college or technical school man may need more detailed instruction.

When the trainee is ready for assignment, the chief instructor notifies the supervisor, who meets him at the center and takes him to his work location. The supervisor is given full opportunity to consult with the instructors concerning the new employee's conduct, performance, and attitude at the center.

SHOP COURSE

For the benefit of design and supervisory personnel in engineering, a shop familiarization course gives an opportunity to become familiar with the basic and special manufacturing tools and equipment, the ways in which they can be used, and their limitations. With this knowledge, the designer can control his design for maximum producibility with the manufacturing facilities available.

Participants are assigned to the program by engineering management, and the course consists of one 2-hr session per week for 12 weeks. Groups are limited to ten persons. Class A design engineers are given first preference, followed by Class B, and then by supervisory and staff engineers.

Sessions are conducted by production engineering personnel, with the first half devoted to presentation and discussion of the subject matter, and the second half to observing the actual operations in the shop.

NEW SUPERVISORS

Early in his new position in management, the newly appointed supervisor is assigned to a training

program for orientation and indoctrination. The course takes one full week and is designed to familiarize him with the five basic phases of management, viz: men, materials, machines, methods, and money; the basic techniques of human relations; the elements of supervision; and labor relations techniques and policies. He is introduced to higher-level management, welcomed into the ranks of management, and made to feel that he is a part of the team. At the same time, he is familiarized with company organization, functions, and general operating policies, and made to understand the duties and responsibilities of his new position.

Among the many subjects covered in this course are material and cost control; indoctrination, assignment and training of new employees; employee counseling and discipline; and safety, housekeeping and plant protection. The current labor contract is reviewed, and the supervisor's position in labor law is thoroughly explained. Methods for prevention and processing of grievances, procedures for employee promotion and transfer, and methods of performance rating are also dealt with.

Reserve Training

To establish a reserve force of potential supervisory and staff personnel, 25 candidates are selected from college graduates and equally qualified company employees who show high potential ability and interest in administrative work. These are given a two-year training program to qualify them to take over such supervisory or staff positions as may occur at any time. They are assigned to one of the major functions of the company, the assignment being determined by testing each man for his capabilities and fields of greatest interest and knowledge.

All the above courses are at the supervisory level. Other courses for specific groups, such as material planners, material control clerks, order writers, templet makers, plastics technicians, draftsmen, riveters and machinists are also in regular operation for on-the-job training.

The company also plans to open its own indoctrination center to teach basic factory operations, such as riveting, drilling, etc., to new employees with no previous experience. This direct job training will be applied in all manufacturing divisions.

Shell Molding Produces Precise Big Castings

SHELL MOLDING has created a great deal of interest among alloy founders and shopmen in the past several years, because it offers extremely close control of casting dimensions and surface finishes, but almost nothing has been published on the subject. New York Naval Shipyard is producing fire-control instrument components and miscellaneous castings, an Eastern malleable foundry is making ammunition elements, other companies are producing valve parts, gears, and automotive castings by this process.

The process is of great potential importance to metalworking plants because of the opportunities it provides to reduce machining radically. Bernard N. Ames, who is in charge of casting development and foundry practice at the Materiel Laboratory, New York Naval Shipyard, gave a detailed description at the recent 125th anniversary meeting of the Malleable Founders' Society.

First impetus for the process in this country came from a sparse description of the technique in the OTS' Report, Fiat No. 1168, dated May 30, 1947. The method was used for casting light-metal and ferrous-alloy fittings at the Hamburg, Germany, plant of Croning Co.

The mold is actually a thin shell specially cured by heating, then backed up by other materials.

Basically, the method utilizes the thermosetting properties of phenolic resins to provide a bond material for silica grains in construction of a mold. It is unique in that neither temper water nor additional bond materials are employed. Resin varies from 5 to 9% by weight of the sand, and generally speaking, the finer the sand, the finer the finish. Mold making is essentially mechanical, utilizing metal pattern plates brought to 350 to 500 F to form the mold. After forming, the plate and adhering coating are heated for 1 min. at 600 F to cure the shell. Then the half molds are stripped and bedded with a backup material. Mold shells are usually $\frac{1}{8}$-in. thick, and backing can be rammed green sand, steel blasting grit, medium steel shot, or copper shot.

Resulting castings are midway between sand-cast and lost-wax castings in tolerance, except that if castings the size of those made in shell molds were investment cast, no closer tolerance would probably be obtained. In malleable iron, tolerances of 0.003 in. per in. are commercially possible, in aluminum about 0.005 in. per in. over all. 25 rounds of ammunition produced this way showed a variation of $5\frac{1}{4}$ oz from a 12-lb base. Hollow and small solid cores, also shell molded, can be used. In malleable and ductile iron, aluminum-base alloys and bronzes, physical properties and internal soundness are slightly superior to green-sand practice.

Obviously, every job is not suited for shell molding. Tool costs are high, and several patterns and core boxes are required; hence, there must be volume production. Further, design of the casting must lend itself to suitable parting, gating, and heading. The final criterion is how much can be saved in cleaning room and machine shop, because the great potential economies of the process are in these two steps.

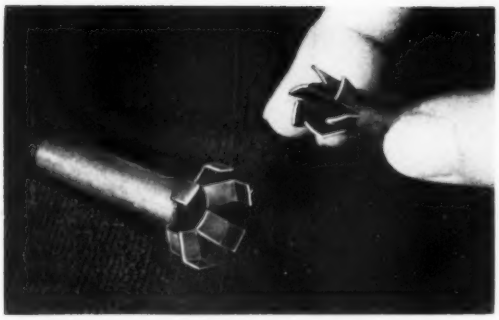
How Segmental Dies Can Slit Pipes

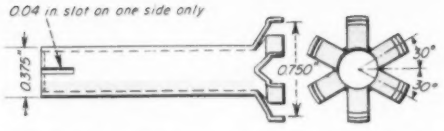
BY RAY J. GOULD, Supt., Mfg. Div., MOTOROLA, INC.

Oscillator pipes for some of Motorola's TV sets are made by splitting out the ends of 2-in. lengths of copper pipe, then flaring these ends to the form illustrated. Cutting to length is simple enough, and the actual flaring job is fairly conventional; but the pipe-slitting job utilizes tooling that is not quite ordinary.

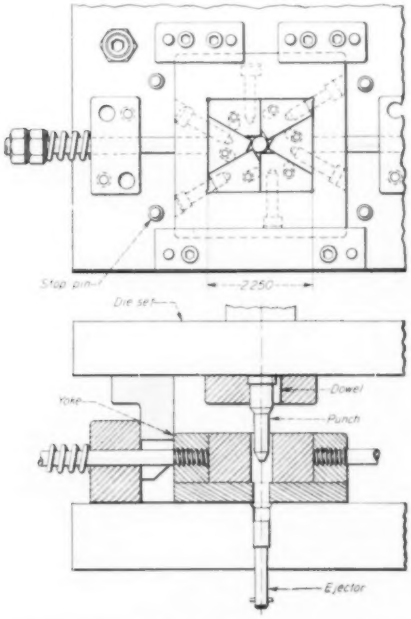
The pipes have an OD of 0.375 in., and ID of 0.323 in., and a finished length of 1.8855 in., within ±0.005 in. Six slits must be cut in the end of each pipe, and these must be 0.040 in. wide and 0.250 in. long. To do this, six die segments are clamped in a die set; and a serrated, bullet-nosed punch is driven by the ram of a converted kickpress fitted out with semi-automatic controls and an air cylinder for fast power.

Individual die segments can be easily removed from the set for regrinding, and can be readily replaced and adjusted.





Hard-drawn copper pipes are cut to length in Brown & Sharpe single-spindle automatic, then slit six ways at one end by segmental die in an air-operated kickpress, and finally flared by split die in bench punch press



Six high-carbon, high-chrome die segments hardened to 63 R_c make up unit that is held inside Danly die set. Assembly is spring-centered under hardened, bullet-nosed steel punch so pipes will be cut equally on all sides

Converted kickpress is No. 10 Framco model with 4-in.-bore, 6-in.-stroke Mead double-acting cylinder mounted vertically over ram. Two pairs of lever-operated control valves insure operator safety by making two-hand control necessary

SHOP SHOTS

at

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MOTOROLA, INC.

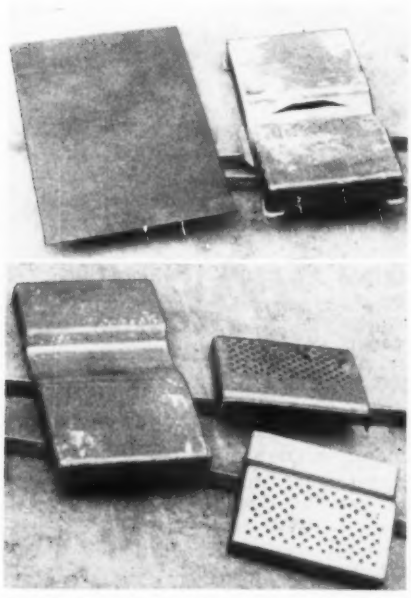
Blast-metallizing is new adaptation of cleaning process; resulting in corrosion-resistant coating on iron and steel parts without dimensional change of parts. After normal abrasive cleaning in Roto-Blast equipment, abrasive is replaced by aluminum, copper, or other ductile, corrosion-resistant metal powder. The fine particles adhere within a few seconds. *C B S Steel & Forge, Inc.*

Deburring drillpress has 3-in. grinding wheel chucked to smooth off faces of flat steel washers. Guide rails on fixture base allow feeding washers into wheel in succession. Plastic shield protects operator, while metal shield behind spindle deflects washers into basket as wheel throws them. Bottom washer faces, on which they slide, are chrome-plated, so adhesive paper is pasted on them for protection of finish. *Manufacturing Div., Motorola, Inc.*

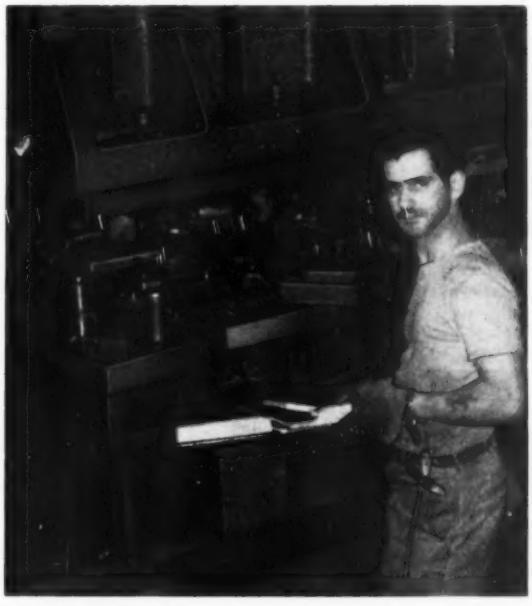
Last half-turn for tight fit of valve assembly is made with ratchet lever on friction-driven wrench shaft. Friction wrench turns taper-threaded generator body into top of fount for lantern until predetermined torque is reached. Final nudge is by hand. *Coleman Co.*

Severe scratches on B-47 skin are guarded against by plastic-lacquer skin that is hand-sprayed or machine-sprayed onto panels or sheets during manufacture and assembly. Skins are stripped off before next operations, then applied again to protect between assembly stages. Thickness is 0.004 in. *Boeing Airplane Co.*

Router undercutting and over-riding are minimized with hand-router templet thickened from $\frac{1}{8}$ in. to $\frac{1}{4}$ in., and router guide changed from 1/8 in. high to 7/32 in. Extra height has proved practical and has been standardized. *Glenn L. Martin Co.*



Poor-drawing steel may be counteracted by change in drawing compound. On double-sheet job for auto radios, steel of poor drawing quality had to replace regular terne plate. Breakage rose, but was dropped back to normal by switching to Johnson No. 150 emulsion, applied with a squeegee, and still wet at the die. The wax was removed by raising caustic-plating-bath temperature to 170 F. *Judson & Rose, Inc.*



METALLURGICAL CONSIDERATIONS IN MACHINING...III

PHYSICAL CHARACTERISTICS OF CAST

No one tool material possesses all desirable qualities. To make and apply carbide tools correctly one should know something about strength and abrasion, impact and cratering resistance

A number of nonferrous alloys high in cobalt have been developed for use as cutting tools. These materials cannot be heat treated and are used as cast from a temperature of about 2300 F. A representative range of analyses for materials of this sort is:

Co %	Cr %	W %	C %
40 to 50	27 to 32	14 to 29	2 to 4

Cast alloys are not as hard as the tool steels at room temperature, but retain their hardness to higher temperatures. Some of the more important properties of a representative tool material of this type are given in Table 1, together with comparative data for a variety of other tool materials.

Under certain conditions, cast-alloy tools give somewhat better tool life than high-speed steels, but they are not in wide use. This is undoubtedly a result of their fragile nature. Like all cast materials, these alloys are relatively weak in tension, hence tend to shatter if subjected to a shock load or if not properly supported.

Cemented Carbides

Today, two general grades of metal-cutting cemented carbides are in use.

1. The cast-iron grade consisting of tungsten carbide with cobalt as a binder, for machining cast irons and nonferrous metals.

2. The steel grade consisting of tungsten, titanium, and tantalum carbides with a cobalt binder, for machining steels.

Representative compositions of three cast-iron grades and three steel grades are given in Table 2. Photomicrographs of the structures of these materials are shown in Fig. 1. Several other compositions are commercially available. In the cast-iron grades the cobalt concentration is varied from 3 to 16%, the materials of higher cobalt content exhibiting the greatest resistance to shock. In steel grades, the tantalum carbide (TaC) content will usually be between 0 to 10%, while the concentration of titanium carbide (TiC) will be from 0 to 16%.

Composition of a cemented carbide is not the sole item that determines its physical properties. The mean grain size is also important. While the only difference between the 44A and 883 grades is the grain size, the coarser-grained material is softer and more shock resistant.

The cemented carbides are unusual in several respects:

1. They have high hardness over a wide range of temperatures.

2. They are very stiff. (Young's modulus is nearly three times that for steel.)

3. They exhibit no plastic flow (yield point) even under stresses as high as 500,000 psi.

4. They have low thermal expansion compared with steel.

5. They have relatively high

***table 1* ... PROPERTIES OF SEVERAL TOOL MATERIALS AT ROOM TEMPERATURE**

	CARBON STEEL	18-4-1 HIGH-SPEED STEEL	Co-Cr-W CAST ALLOY	CEMENTED CARBIDE		ALUMINUM OXIDE	SILICON CARBIDE
				STEEL GRADE	CAST-IRON GRADE		
Brinell Hardness	700	700	600	1,350	1,400	1,900	2,200
Compressive Strength, psi	170,000	600,000	300,000	350,000	500,000		
Transverse Rupture Strength, psi	225,000	250,000	60,000	150,000	180,000		
Young's Modulus psi × 10^{-6}	30	32.5	35	85	90	71	
Shear Modulus psi × 10^{-6}	11.5	5.0		35	38		
Coefficient of Thermal Expansion × 10^{6}, F	8.2	7.0	8.0	3.5	3.0	4.3	
Thermal Conductivity BTU/sec in.^{2} (F in.) × 10^{4}	7.85	3.4		4.5	11.2	0.56	1.35
Specific Heat BTU lb F	0.11			0.6	.05	.18	

ALLOYS AND CARBIDES

BY MILTON C. SHAW and PRESCOTT A. SMITH
Associate Professors of Mechanical Engineering
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Fig. 1 . . . Mean grain size of carbides affects the hardness and shock resistance of the various grades of carbides. These photomicrographs were made at a magnification of 1500 times by the Carboloy Co.

thermal conductivity (especially the cast-iron grades).

6. They have a strong tendency to form pressure welds at low cutting speeds.

These unusual properties call for special consideration in the design of carbide-tipped tools. The great stiffness of carbides requires that they be well supported on a shank of sufficient thickness, because even a small amount of bending deformation may induce very high tensile stresses.

Like all brittle materials, cemented carbides are weaker in tension than in compression. A cemented-carbide tool should be proportioned so that tensile stresses are kept low. This is particularly important when the tensile stress arises from a dynamic or shock load, as in intermittent cutting.

The relatively small coefficient of expansion of cemented carbides makes it necessary to use a relatively thin layer of braze metal. If this precaution is observed, the braze will not crack upon cooling as a result of large tensile stresses arising from differential contraction of the carbide and the braze metal.

Because of the adverse pressure-welding characteristics of cemented-carbide tools, they should be operated at speeds considerably in excess of those used with high-speed tools. This calls for machine tools of increased power. Also, inasmuch as the tendency to chatter generally increases with increased speed, such machines should likewise be more rigid.

Dawihl in Germany found that the function of cobalt in cemented carbide is not merely that of a binder, but that it also acts as a medium in which the carbides can grow together into a continuous skeleton. This skeleton has considerable bending strength.

Carbide Skeleton

Existence of a carbide skeleton in cemented carbide as opposed to the isolated chromium and vanadium complex carbides in the relatively weak altered ferrite matrix of high-speed steel accounts for the unusual properties of the cemented carbides. This difference in structure explains the relatively large Young's modulus and the high strength and hot hardness of the cemented carbides. Low values of thermal expansion and the absence of plastic flow in the cemented carbides, even at high values of stress, may also be attributed to the relatively high stiffness of the carbide skeleton.

As we shall see in the next installment, the relative tendency for the workpiece to adhere or weld to the tool is an important consideration with regard to tool wear. Dawihl made a number of static tests to determine the relative tendency for metals to weld. He clamped small cubes with lapped surfaces in contact in a furnace having a reducing atmosphere and determined the temperature at

table 2 . . . REPRESENTATIVE CEMENTED CARBIDES

	CARBOLOY GRADE	WC	COMPOSITION, % Co	TaC	TiC	KENNA-METAL GRADE	ABRASION RESIST-ANCE	IMPACT RESIST-ANCE	CRATER RESIST-ANCE	YOUNG'S MODULUS PSI X 10 6	SHEAR MODULUS PSI X 10 6	ROCKWELL HARDNESS
Roughing Cut - CI	44A	94	6	—	—	K-6	M	M	L	84.5	36.0	91.0
Medium Cut - CI	883	94	6	—	—	K-6	H	L	L	88	36.5	92.0
Finishing Cut - CI	905	97	3	—	—	K-8	H+	L-	L	—	—	92.1
Roughing Cut - Steel	78C	85	10	1	4	K-2S	L-	H+	M	—	—	90.5
Medium Cut - Steel	78B	82	10	—	8	KM	L	H	H	—	—	85.0
Finishing Cut - Steel	78	76	8	4	12	K3H	L+	H-	H	90	—	92.0

L = Low M = Medium H = High

which the blocks first adhered. This is called the adhesion temperature.

A summary of Dawihl's results is given in Table 3. From these data it is evident that:

1. The tendency for a cemented carbide to weld to steel increases with increased cobalt content (i.e., with decreased hardness of the cemented carbide).

2. Tungsten or titanium carbides have much less tendency to weld to steel than do the products containing cobalt.

3. The tendency to weld increases with decreased hardness of the steel.

4. The tendency for steel to weld to high-speed steel is greater than for steel to weld to a cemented carbide.

5. There is less tendency for steel to weld to a cemented carbide when titanium carbide is present. This is also true of tantalum carbide.

The reason for the higher adhesion temperatures of cemented carbide containing tantalum or titanium carbides has been attributed to the tendency for these carbides to oxidize and form a protective coating which prevents the cobalt binder from welding to steel so readily. In a similar way, the presence of graphite in cast iron is believed responsible for the lesser tendency for cast iron to weld to a cemented carbide than for steel to weld to carbide.

Diamond Tools

Diamond-tipped tools are used for special applications such as the production of surfaces of high finish on soft materials that are normally difficult to machine. The general properties of diamond may be summarized:

1. Hardest known substance (Brinell hardness = 7000)

2. Lowest thermal expansion of any known substance (about 60% that for Invar and about 12% that for steel)

3. High heat conductivity (twice that for steel, one-third that for aluminum).

4. Poor electrical conductor.

5. Burns to CO_2 when heated to about 1500 F in air.

6. Very low coefficient of friction against metals.

When diamond is used for a cutting tool, these properties must be kept in mind. Since very high hardness is always accompanied by brittleness, a diamond tool must be cautiously used to avoid rupturing the point. This usually limits the use of diamond tools to light continuous cuts in relatively soft metals. Low values of rake angle are normally used to provide a stronger cutting edge. (For example, in turning aluminum the following values of rake angles might be expected: high-speed-steel tool, 40°; cemented-carbide tool, 15°; diamond, 0°.) The very low friction and high heat conductivity provide a low operating temperature and make it possible to use high speeds (greater than 500 sfpm), despite the fact that a diamond will decompose in air at temperatures above about 1500 F.

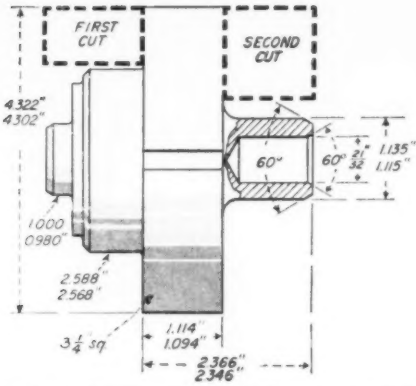
The relatively high cost of diamonds that are satisfactory for tools is partially responsible for their limited use. Diamond cutting tools are usually made from boarts and are sold by the carat (1 carat = 0.2 gm = 0.00044 lb).

Part IV of "Metallurgical Considerations in Machining" will appear in an early number.

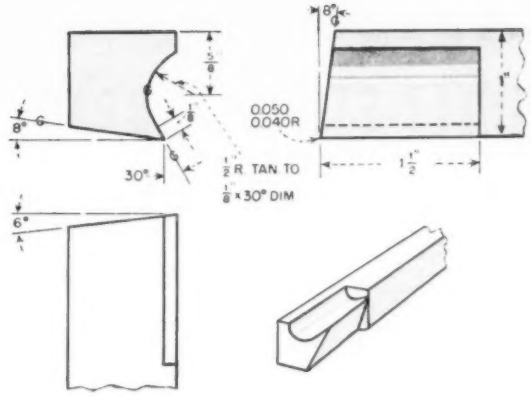
table 3 . . . ADHESION TEMPERATURES OF METALS*

MATERIAL	DEG. F
STEEL (BRINELL 170) WITH:	
WC	1830
WC + 1% Co	1425
WC + 5% Co	1155
WC + 20% Co	1155
WC + 15% TiC + 5% Co	1425
TiC	2055
Co	1020
High-Speed Steel	1065
STEEL (BRINELL 310) WITH:	
WC	1920
WC + 1% Co	1470
WC + 5% Co	1380
WC + 15% TiC + 5% Co	1560
TiC	2100
Co	1380
GREY CAST IRON (BRINELL 200) WITH:	
WC + 5% Co	1290
WC + 15% TiC + 5% Co	1515

*Under compressive stress of 4200 psi

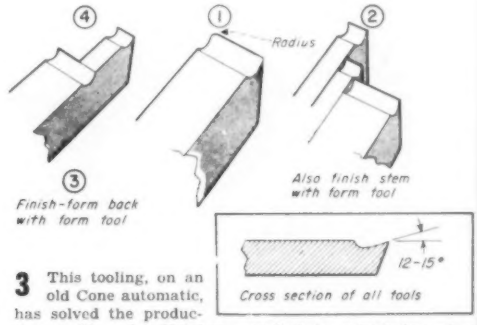


1 Tough Turning—This hydraulic head, of Nitralloy G, required five passes with carbide to produce the necked portion, then broke down the tool in an hour. Apparently the aluminum in this Al-Cr-Ni alloy cuts clean until the sharp edge is worn from the tool, then it workhardens directly ahead of the toolbit. Interrupted cut at the start caused rapid tool wear



2 Nitralloy Nemesis—This highrake tool of M-6 tungsten-molybdenum-cobalt superHHS was first used on the hydraulic-headturning job. With 0.004-ipr feed, 1⅛ in. depth of cut across corners and 90-sfpm speed, this tool operated for 16 hr and showed no visible wear. Cutting took 50% less power than with conventional carbide tools. Added height at back curls chips for easy disposal

Straight Forming Licks Tough Nitralloy Job



3 This tooling, on an old Cone automatic, has solved the production problem for Ketchen, resulted in completion of a piece in as little as 4 min., floor to floor. Note that roughing loads are divided between spindles

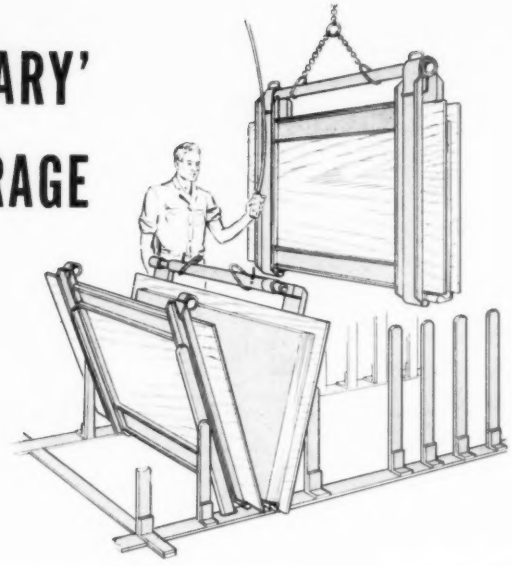
THE interesting turning job in Nitralloy modified G (sketch 1) reported a year ago from American Bosch in Springfield, Mass. (*AM*, Aug. 7, '50 p 101) is now being done in quite a different way. The original setup was on a turret lathe with high-rake turning tools (sketch 2). The job was shortly thereafter subcontracted to H. B. Ketchen & Son, Belchertown, Mass. It was set up on an old 3½-in., 4-spindle automatic, but all sorts of troubles developed. High-rake tools lost edges too quickly, carbides crumbled, and chatter threatened to shake the machine apart. The original schedule of 20 pph actually worked out nearer to 50 ppd of 9 hr because of feed problems and tool breakdown.

Systematic testing of tool materials and angles resulted in some improvement, but tool life was so short the operator was supplemented by a tool grinder. Cutting speed was dropped to 75 sfpm, but even then the coolant was so hot, after 15 pieces, that it could not be touched. Fred Goulding of White & Bagley took samples back with him, and W & B developed a special extreme-pressure cutting fluid, loaded with fats and sulfur. This cut heat to a reasonable degree, and rearrangement of cutting cycles (so all spindles had uniform loading) reduced chatter, vibration, and play.

Dividing the hogging cuts between the spindles took the twist out of the reel. Knee cutting proved inadvisable, so all cuts are now straight infeeds. The previous piece is cut off and ¾ in. of the stem is formed to diameter at Position 4. Stem hogging is completed, with corner fillet, in Position 1, the multiple-diameter back is rough-formed and the stem completed in Position 2, and the back finish-formed in Position 3. Top rake angle of 12 to 15° proved best and is used on all tools. Vasco Supreme proved 50% better than any other material under the conditions, and if properly ground will last practically a shift.

These changes resulted in a cycle just under 5 min. Average production is now 100 ppd (9 hr), with an output of 135 on the best day. Finish is good and within tolerances.

SHEET-STOCK 'LIBRARY' FOR EFFICIENT STORAGE



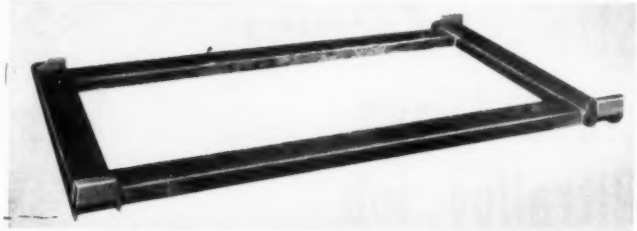
MAKING Pratt & Whitney's Turbo-Wasp jet engines calls for sheets of 14 different alloy steels, 11 aluminum alloys, and a nickel-chrome alloy; all ranging in thickness from 0.018 in. to about 0.250 in. All told, P & W has to store 355 different gages and compositions of sheet metal. But an idea that is expected to save 90% of the manhours that might be spent in handling these stocks has simplified the storage problem.

Based on the design of a pocket notebook, an angle-iron "library" for sheet-metal "books" was built. Each different book holds a different size, composition, or gage of metal; but each book is a cinch to rip apart.

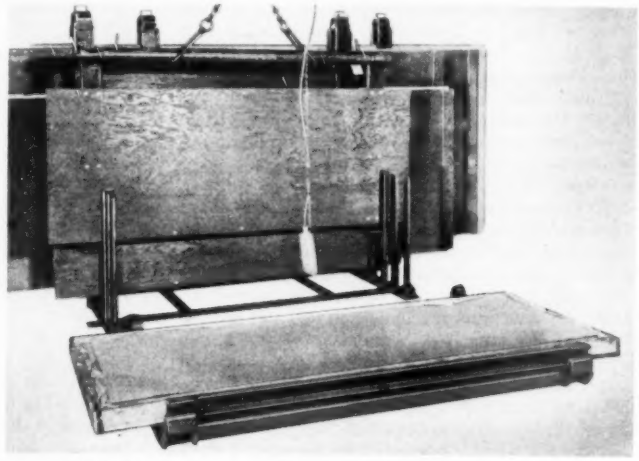
As shown in the accompanying photographs, a book is made up each time a new package of stock is received from the producer. Once stacked in the library, the book can be quickly opened and any number of "pages" taken out with a minimum of effort.

It works this way: Each library section has a set of widespread uprights at its outer end—near the aisle. These are spaced so the book, when set between them, will fall open with the covers at a 70° angle. A crane simply picks up the book desired, sets it between the upright posts, and a worker slips the top pins out to allow the covers to fall apart. Thus, the sheets are well exposed, and they can be lifted out for processing with little waste of time or effort.

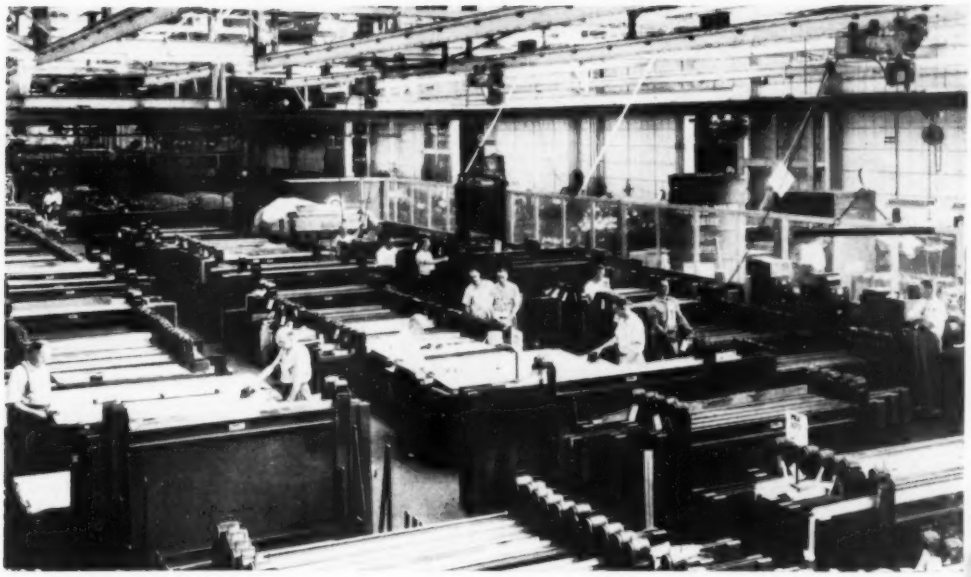
Vertical storage saves 50° in floor space over flat storage—not a small item with such a large stock necessary. All-mechanical handling has the advantage of protecting stock from excessive scratching and marring, too.



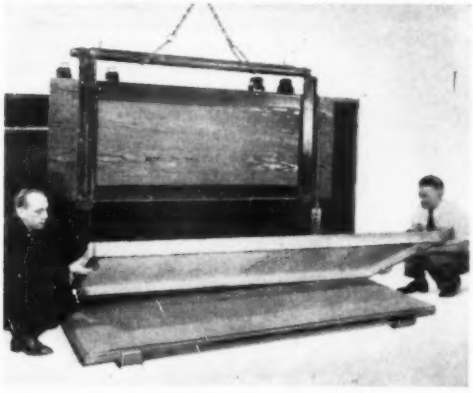
1 **Book is built up** from transfer rack on floor. Hoisting bar has spring-loaded pins, which slip into round straps on rack, at its ends



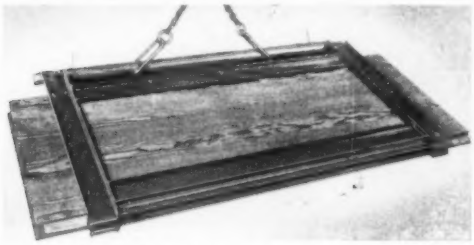
2 **Crate of stock** is laid on rack, top is removed, then steel channel (foreground) is interlocked with rack to act as book backbone



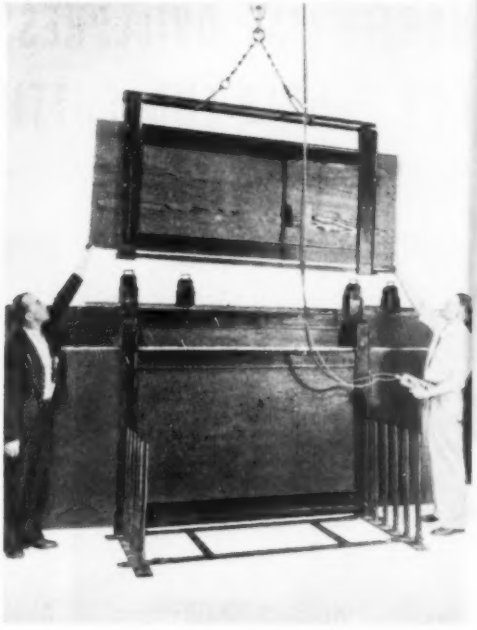
Complete file of special sheet alloys and gages wastes little floor space; provides unusually convenient storage area



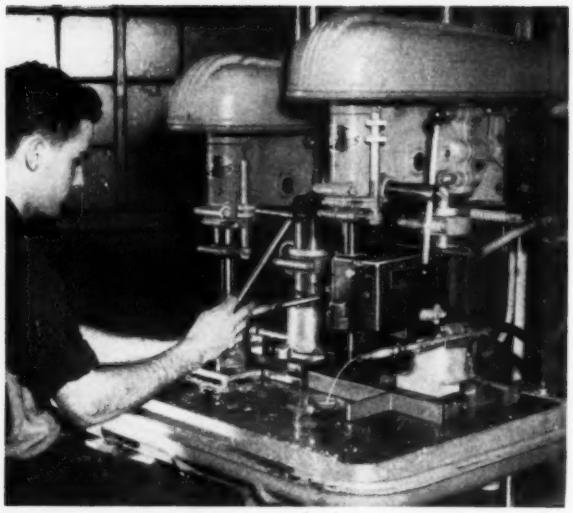
3 **Plywood reinforced with steel** (like one on hoist) is interlocked with backbone, assembly is turned over, transfer rack is removed, and remainder of crate is removed



4 **Second plywood sheet** is interlocked in place of transfer rack to act as book cover, and open edge of book is locked by hoist-bar pins



5 **Book is filed** in library and is cataloged. In the racks, books are held closed by vertical bars; hoisting-bar pins do this only when book is being moved



Vertical drills in conventional setup drill and tap pipe threads in valve bodies. Work is gripped in enclosing jig, which is positioned against angle plates bolted to table

HORIZONTAL DRILLPRESSES FOR DOUBLE-END CUTTING

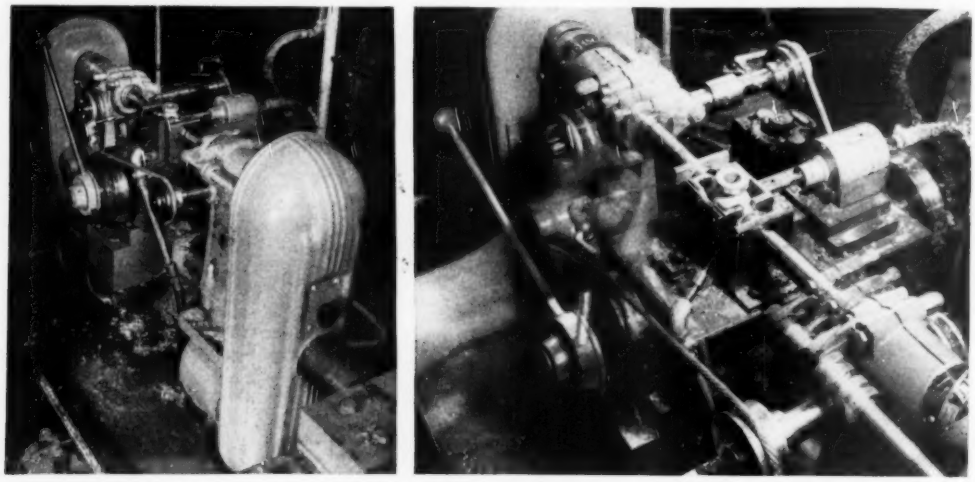
BY H. J. MacDONALD, Chief Industrial Engineer, Valve Div., Minneapolis-Honeywell Regulator Company

VALVE BODIES can be drilled, tapped, faced, and bored very well in conventional setups with standard drillpresses; yet even when a special setup cannot be immediately justified, new equipment that can be applied later elsewhere in the plant may be worthwhile.

When Minneapolis-Honeywell valve engineers took on an order for 10,000 valve bodies for home-heating units and refrigerators, they figured this way—by making special setups with standard new drillpress units, they could raise production and accuracy, and the units could easily be switched to other jobs after the valve order was completed.

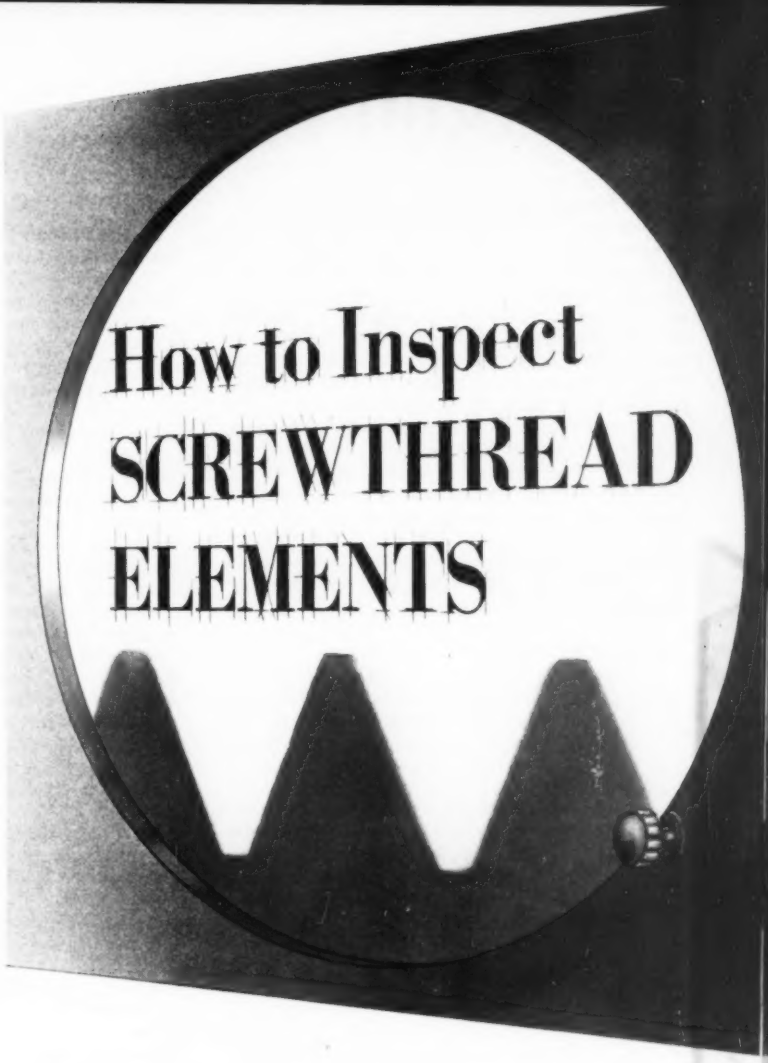
The job consisted of five operations, for which seven machines were utilized: two turret lathes, three ordinary drillpress (double) units, and two horizontally mounted double units working on a single column each. The operations ran this way: Drill and tap two pipe holes (regular Delta setup), bore two holes and face flanges (horizontal Delta setup), tap two pipe threads (horizontal Walker-Turner setup), turn and face (turret-lathe setup—Gisholt, Bardons & Oliver), and face boss and tap one thread (standard Delta setup).

Durability and cost of the machines were considered before they were purchased; and adaptability was an important point. After the production run is completed, the two horizontal setups, which are essentially the same, can be utilized either as is or can be revamped into table-drillpress units.



Horizontal drills in unusual setup bore holes for tapping operation and face flanges of valve bodies. Work is set in jig, then pedal-operated air cylinder closes rear jaw. Double exposure, right, shows feeding action. Hand (foreground) pushes lever to left, rotating central shaft and pulley, and operating feed drums of both drills. Support brackets for feed spindles can be seen in both retracted and extended positions

How to Inspect SCREWTHREAD ELEMENTS



THIS REPORT...

...Describes practical inspection methods

...Discusses alternate measurement methods

...Shows how to save inspection time

...Points out common inspection errors

...Guides production planning

...Outlines salvage procedure

BY WILLIAM M. STOCKER, JR.
ASSISTANT EDITOR

THREAD inspection is difficult and time-consuming, nonproductive—but essential. It adds nothing to the value of the product, but it does determine thread quality and determines whether or not a particular thread qualifies for inclusion in an interchangeable assembly. Inspection thus is really qualification, a control over all other operations. It can be done swiftly and well—with the right tools.

Thread inspection methods vary with each part and its application. For this reason the entire operation is divided into two technique groups: analytical and functional inspection. The first is an examination of the individual thread components, while the second (functional group) is primarily to determine the over-all assemble-ability of the thread. Analytically we examine each part of the thread; functionally we examine the whole thread. This report will be devoted largely to analytical inspection; another, in the near future, will describe functional inspection and gages.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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TWO INSPECTION METHODS

THREAD inspection is largely gaging—to determine whether the component parts of a mechanical product comply with the dimensional requirements of contracts, drawings, and specifications. This product may be made by a single manufacturer or parts may be made by several manufacturers variously located. In either case, all parts which fit the specifications should be suitable for assembly.

Most gages are checked by *analytical* inspection for each component of the thread. So also are the threads used in precision parts and where maximum qualities are necessary in products such as aircraft bolts. By far the largest proportion of threaded parts are checked by *functional* inspection methods. The latter will not give any one dimension accurately, but provide an average of all the dimensions, the resultant of which is either satisfactory or not. For the usual screwthread uses, this meets the necessary requirements.

Analytical vs functional

Shop inspection accuracy and efficiency can only be guaranteed when all functional gages are checked periodically by analytical methods or against known master standards. This may be done once a week, once a month, or even every day. Gages and other measuring instruments are in two categories, comparative and direct reading. Comparative gages are used most widely for thread inspection. These tools are preset to the specified size with standard gage blocks or direct-reading instruments. Some are provided with very accurate direct-reading scales as well, to show variations from the preset standard.

Male, or external, threads may be inspected and measured by a variety of methods. These present no serious problem to the inspector unless an unusual dimensional location is specified or the tolerances are extremely tight. Internal, or female, threads, on the other hand, present a real problem. These are even more difficult to inspect than they are to produce—and the manufacturing difficulties increase the importance of sound inspection practice. This is particularly true of threads under $1\frac{1}{2}$ in. dia and of threads more than one diameter in length. Until recently only thread plug gages or a cast form could be used to check internal threads. A newly developed device utilizes a dial indicator to compare internal threads to a standard. This is a forward step.

Rule Number One for thread inspection is, "*Know what you are looking for before you start.*" After that, be certain that you can account for every operational error that may be introduced. With the proper equipment, the rest is not difficult.

By familiarizing yourself with the errors most likely to occur as a result of any given threading method, much time can be saved.

SCREWTHREAD TERMS

Just as standards are necessary to maintain interchangeability, it is also important to standardize on the terminology. Most-used terms are:

Screwthread—A ridge of uniform section in the form of a helix on the external or internal surface of a cylinder, or in the form of a conical spiral on the external or internal surface of a cone.

External (male) thread—A thread on the outside of a member.

Internal (female) thread—A thread on the inside of a member.

Major diameter—The largest diameter of the thread of the screw or nut. *This term replaces the term "outside diameter" as applied to the thread on a screw and "full diameter" as applied to the nut.*

Minor diameter—The smallest thread diameter of the screw or nut. *Replaces "core or root diameter" as applied to the screw and also "inside diameter" as applied to a nut thread.*

Pitch diameter (simple effective diameter)—On a straight thread, the pd is the diameter of the imaginary co-axial cylinder, the surface of which would pass through the thread profiles at such points as to make the groove width equal to one-half of the basic pitch. On a perfect thread, this occurs at the point where the widths of the thread and groove are equal.

On a taper thread, the pd at a given position on the thread axis is the diameter of the pitch cone at that position.

Pitch—Distance measured parallel to thread axis between corresponding points on adjacent thread forms in the same axial plane and on the same side of the axis.

Lead—Distance a threaded part moves axially, with respect to a fixed mating part, in one complete revolution.

Threads per inch (tpi)—Reciprocal of the pitch in inches.

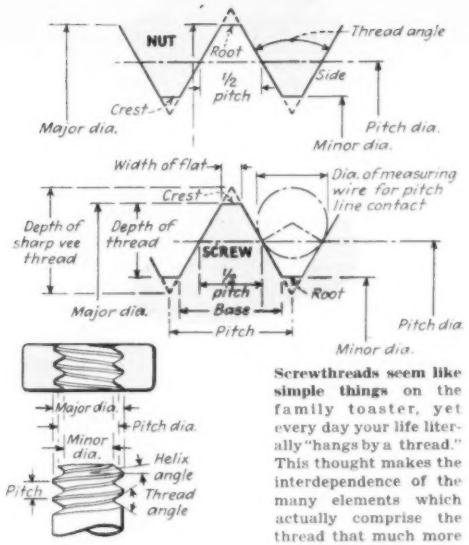
Turns per inch—Reciprocal of the lead in inches.

Included angle—Angle between thread flanks measured in an axial plane (also "angle of thread").

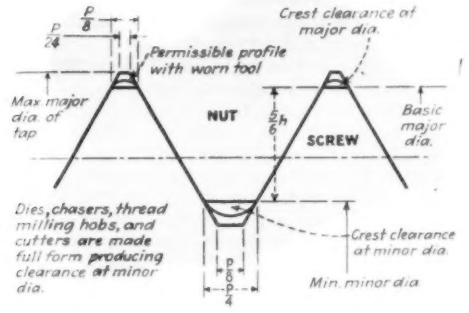
Flank angle—Angle between individual flanks and the perpendicular to the thread axis, measured in an axial plane. On a symmetrical thread it is commonly termed the "half-angle of thread."

Lead angle (helix angle)—On a straight thread, angle made by the thread helix at the pitch line with a plane perpendicular to the axis. On a taper thread, lead angle at a given axial position is the angle made by the conical spiral of the thread at the pitch line with the plane perpendicular to the axis at that position.

Thickness—Distance between thread flanks, measured at a specified position and parallel to the thread axis.



Screwthreads seem like simple things on the family toaster, yet every day your life literally "hangs by a thread." This thought makes the interdependence of the many elements which actually comprise the thread that much more important



Ideal screwthread assembly provides a maximum metal-to-metal contact. New tools, well sharpened, will produce the full clearance form, but as they wear, the round form appears at the thread root. On British threads the rounded root is standard. Unified thread standards permit it for new tools

Thread height (thread depth)—Distance, measured perpendicular to axis, between major and minor cylinders or cones, respectively.

Height of fundamental triangle—Same as thread height except that measurement is between the *sharp* major and minor cylinders.

Addendum—On an external thread, the distance, measured perpendicular to the axis, between the major and pitch cylinders, or cones, respectively. On an internal thread, the distance, measured perpendicular to the axis, between the minor and pitch cylinders, or cones, respectively.

Dedendum—On an external thread, the distance, measured perpendicular to the axis, between the minor and pitch cylinders, or cones respectively.

Crest truncation—Distance, measured perpendicular to the axis, between the sharp crest (crest apex) and the cylinder or cone which bounds the crest.

Root truncation—Distance, measured perpendicular to the axis, between the sharp root (root apex) and the cylinder or cone which bounds the root.

Effective size (virtual effective diameter)—Diameter derived by adding to the pd, for an external thread, or subtracting from the pd for an internal thread, the cumulative effect of pitch and angle errors.

Length of thread engagement—Distance between extreme points of contact on the pitch cylinders, or cones, of two mating threads; measured parallel to the axis.

Depth (height) of thread engagement—Distance, measured perpendicular to the axis, by which the thread forms of two mating threads overlap each other.

Crest clearance—In a thread assembly, the distance, measured perpendicular to the axis, between the crest of one thread and the root of its mating thread.

Tensile stress area—Assumed area of an external threaded part, used for computation of tensile strength.

Terms relating to taper screwthreads only:

Pitch cone—An imaginary cone, the surface of which would pass through the thread profiles at such points as to make the groove width equal to one-half of the basic pitch. On a perfect thread, this occurs at the point where thread and groove widths are equal.

Major cone—An imaginary cone whose apex angle equals that of the pitch cone, the surface of which bounds the crest of an external thread or the root of an internal thread.

Sharp major cone—Same as major cone, except that the surface of the imaginary cylinder passes through the *sharp crest* of an external thread or the *sharp root* of an internal thread.

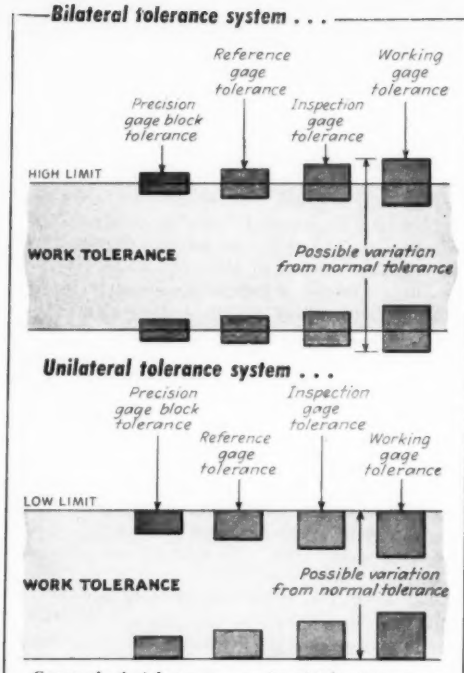
Minor cone—An imaginary cone whose apex angle equals that of the pitch cone, the surface of which bounds the root of an external thread or the crest of an internal thread.

Sharp minor cone—Same as minor cone, except that the imaginary cylinder surface passes through the *sharp root* of an external thread or the *sharp crest* of an internal thread.

Standoff—Axial distance between specified reference points on external and internal taper threaded members or gages, when assembled with a specified torque or under other specified conditions.

CLASSIFICATIONS AND TOLERANCES

At one time there were eight different classes of screwthread fits, from loose fit to force fit. This was unnecessary from a design point of view and caused far more confusion than it achieved good. In 1942 the National Bureau of Standards designated five distinct classes of fit. These five classes of fit, together with the accompanying specifications, were for the



Gagemaker's tolerances may be either of the two shown, or a modification of either. Choice of system used is based on many factors: type of product, its use, anticipated useful life, selling price vs cost, degree of quality, manufacturing facilities, and so forth. "Go" gages control interchangeability or assemble-ability. "Not Go," "HI," or "LO" gages control permissible degree of looseness. Tolerances must be applied in terms of tool life, gage life, part function, and always with the end result in mind

purpose of insuring the interchangeable manufacture of screwthread parts throughout the country. The fits given do not arbitrarily place a general class or grade of work in a specific class of fit. Manufacturers and users of threads are free to select the class of fit best suited to a particular need, from this group:

Class 1—Includes screwthread work in which the threads must assemble readily.

Class 2—Includes the major portion of interchangeable screwthread work such as finished and semi-finished bolts and nuts, and machine screws.

Class 3—Includes the highest grade of interchange-screwthread work.

Class 4—Includes screwthread work requiring a fine, snug fit, somewhat closer than class 3. In this class, selective assembly may be necessary.

Class 5—Includes interchangeable screwthread work, consisting of steel studs set in hard materials, such as CI, steel, and bronze, where a wrench-tight fit is required. This class is still tentative.

Dimensional specifications for these fits are such that a screw made to tolerances of one fit may be used with a nut or tapped hole made to tolerances of some other fit. The resulting fit may represent an intermediate class or may approximate one of the classes of fit designated as standard. Note that the fit class number designates the permissible limits of looseness or tightness only. It has no connotations of *quality* in any other sense.

In 1944 the class 4 fit was discontinued as a standard as the need for it was not sufficient to warrant its use. By combining a class 3 and a class 5 fit, an equivalent result could be achieved. Many companies are still using these standards of fit in their designs. More recently, however, a major improvement was made in the system as a result of the Unified Standard thread series.

Unified fits

Class 1, 2, and 3 fits have been reevaluated and redesignated class 1A, 2A, 3A, and class 1B, 2B, 3B. The "A" group applies to external threads only and is a minus tolerance; is applied from the maximum (or design) size to below the maximum size. The "B" group applies to internal threads and the tolerance is plus; applied from the basic size to above basic. Combinations of A and B classes will provide just about any fit needed for interchangeable manufacturing. This series makes possible thread interchangeability between Canada, Great Britain, and the United States. It is rapidly being adopted.

Tolerances for American National Thread form were derived by combining two factors, known as net pitch-diameter tolerance and gage tolerance. Theoretical net tolerances for all screws and nuts of a given class of fit bear a definite mathematical relationship to each other. It was intended that these should in no way be reduced by permissible manufacturing tolerances for master gages; that is, gages within the original gage tolerances established in the 1921 NSTC Progress Report. These were approximately equivalent to class X tolerances. Hence, the net tolerances were increased by the equivalent diametral space required to provide for the gage tolerances on diameter, lead, and angle to produce the extreme tolerances specified for the product. In practice, the actual net tolerances will depend upon the method of gaging and upon the accuracy of the gages used.

The net pitch-diameter tolerances for the various classes of fit are based on the following series for a pitch of 1/20 in.:

Class 1 fit—0.0045 in.
Class 2 fit—0.0030 in.
Class 3 fit—0.0020 in.

Pitch-diameter tolerances for pitches finer than 1/20 in. are to each other and to the tolerance for 1/20 in. as the 0.6th power of their respective pitches.

Pitch-diameter tolerances for pitches coarser than 1/20 in. are to each other and to the tolerance for 1/20 in. as the 0.9th power of their respective pitches.

The exponent 0.6 was chosen for pitches finer than 1/20 in. because the resulting tolerances, except

in two instances, do not vary more than 0.001 in. from the pd tolerances specified in the ASME Machine Screw Standard.

Tolerances for screwthreads of special diameters, pitches, and lengths of engagement are obtained by adding three values, or increments, one dependent upon the basic major diameter, another upon the length of engagement, and the third upon the pitch. However, in the standard tables, pitch-diameter tolerances are usually listed in the positions corresponding to standard sizes, pitches, and lengths of engagement of the American National coarse and fine thread series. Values adjacent to these listed values are either reduced or increased so that none shall exceed, nor be less than, these standard values:

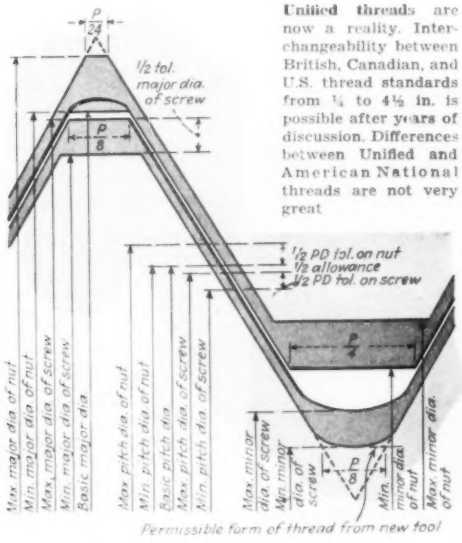
Tolerance increments for special threads:

Class of Fit	Diameter Increment	Length of Engagement Increment	Pitch Increment
Class 1	$0.002\sqrt{D}$	0.002 Q	$0.020\sqrt{p}$
Class 2	$0.002\sqrt{D}$	0.002 Q	$0.010\sqrt{p}$
Class 3	$0.002\sqrt{D}$	0.002 Q	$0.005\sqrt{p}$

For 8-, 12-, and 16-pitch thread series, and the extra-fine thread series, class 3 tolerances are 70% of class 2 tolerances as derived from these formulas.

Lead and angle errors vs pd tolerances

Pitch diameter is the nucleus from which all the other thread dimensions are built. But, as mentioned before, pd tolerances include all errors of pd, lead, and angle. There is available in tabulated form the maximum errors of lead and angle, each of which can be compensated for by one-half of the specified pd tolerances. These equivalents are derived from definite mathematical relations.


P/24
½ tol. major dia. of screw
P/8
½ PD tol. on nut
½ allowance
½ PD tol. on screw
P/4
Max. major dia. of nut
Min. major dia. of nut
Max. major dia. of screw
Min. major dia. of screw
Basic major dia.
Max. pitch dia. of nut
Min. pitch dia. of nut
Basic pitch dia.
Max. pitch dia. of screw
Min. pitch dia. of screw
Max. minor dia. of screw
Min. minor dia. of screw
P/8
Min. minor dia. of nut
Max. minor dia. of nut
Permissible form of thread from new tool

Unified threads are now a reality. Interchangeability between British, Canadian, and U.S. thread standards from ¼ to 4½ in. is possible after years of discussion. Differences between Unified and American National threads are not very great

Diameter equivalent of Lead Errors—relationship between lead error between any two threads within the length of engagement, and its diameter equivalent: $E' = (\pm p') \cot a$,

where: E' = pd increment resulting from lead error
p' = max pitch error between any two engaged threads
a = half-angle of thread

The quantity E' is always added to the measured pd in the case of an external thread, and it is always subtracted from the pd of an internal thread, regardless of the sign introduced by the lead error p'. For American National form threads, the formula is:

$$E' = 1.7321\ p'$$

For Acme thread form the formula reduces to:

$$E' = 3.8667\ p'$$

Diameter equivalent of Angle Error—The general formula which expresses the relation between error in the half-angle of thread and its diameter equivalent (i.e., the amount of the pd tolerance absorbed by such an error) is:

$$\cot a' = \frac{h}{E'' \sin a \cos a} \pm \cot a,$$

in which:

E'' = pd increment resulting from error in ½ angle
h = basic thread depth
a = basic half angle of thread
a' = error in half angle of thread

For American National form threads, the formula is:

$$\cot a' = \frac{3p}{2E''} \qquad \text{or } E'' = 1.5\ p \tan a'$$

For the thread form recommended for pipe thread gages, the formula becomes:

$$\cot a' = \frac{1.53812\ p}{E''} \quad \text{or } E'' = \frac{1.53812}{n} \tan a'$$

For Acme thread form, the formula becomes:

$$\cot a' = \frac{2.06267\ p}{E''} \quad \text{or } E'' = \frac{2.06267}{n} \tan a'$$

Proper method of holding three wires and threaded workpiece for measuring pd with a micrometer caliper. Three-wire method is best for measuring pd; may also be used to measure angle. For more accurate measure across wires, a supermicrometer or an electrical or mechanical indicating comparator is used

FUNDAMENTALS OF GAGING SCREW THREADS

GAGING is intended to: (1) Control elements of the threaded product within the prescribed limitations, and (2) segregate or reject product outside of those limitations. Gaging is a comparative process by which a thread is checked against design drawings, specifications, or other prescribed requirements. Gages perform the investigation or degree of qualification. Gages, in the usual sense, are distinguished from measuring instruments in that they do not yield numerical values in standard units of measurement. They are intended, primarily, as a functional check to ascertain whether a product thread is within the prescribed maximum and minimum product limits; they establish the interchangeability of a threaded part.

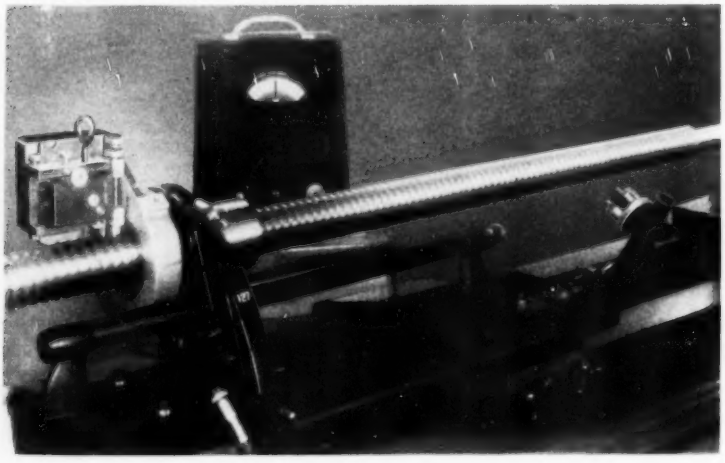
Product gaging can be done in two ways—by *attributes* and by *variables*. Depending on the methods, the purposes are: (1) by attributes, to assure that the product is within prescribed size limits; (2) by variables, to measure the extent of deviation of threaded product from prescribed size limits. Each method has its place, but sharp distinctions are usually impossible. Attribute gaging may be designated "limit gaging", while the variable method is called "indicating gaging". Indicating gages may be used as limit gages for attribute gaging; quite often are more suitable, but a true limit gage can never be used for gaging by variables.

Limit gages are classified in two groups: (1) maximum metal limit gages, known as "Go" gages which control the minimum looseness or maximum tightness in fit of mating parts and accordingly control interchangeability. (2) Minimum metal limit gages *now* known as low "LO" limit gages for external threads and high "HI" limit gages for internal threads. Formerly these "HI" and "LO" limit gages were known as "Not Go" thread gages and they limit the amount of looseness or minimum interference between mating parts; thus control to a great degree proper functioning of components.

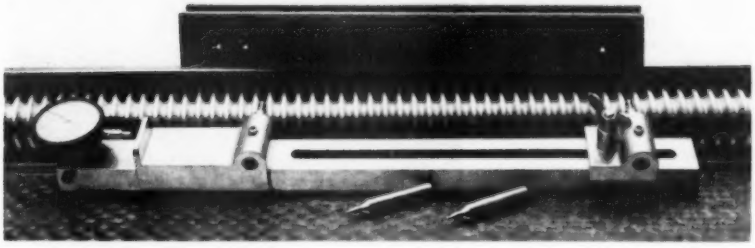
"Go" thread gages should check, simultaneously, as many thread elements as is practicable. Threads are acceptable as within the maximum metal limits provided that all complete threads can enter in or be entered by their Go gages.

LO and HI thread gages should check as nearly as practicable pitch diameter only. Hence, the effects of other thread elements are minimized in these gages by shortening the length of engagement, increasing crest truncation, and widening root clearance as compared to Go gages. Of course, the pd measurement includes functions of lead and angle. Threads are acceptable, as within the minimum metal limits if, when using plug and ring, or similar, threaded gages, the HI gage does not enter or the LO gage is not entered. Also, threads are acceptable if all complete threads can enter in the LO gage or be entered by the HI gage, provided that a definite metal-to-metal drag is felt on or before the *third* turn of entry. The latter allowance is new; the original "Not Go" gages were not allowed to enter at all. By allowing the gage to enter, a better estimation of thread quality is obtainable. However, extreme applications such as very thin or ductile material, small number of threads, thin-walled tubing, or very fine pitch may necessitate modification of this practice.

Limit gages are available in a number of styles. The most widely known, used, and understood are the thread plug and ring gages. Plug gages are Go and HI, and ring gages are Go and LO. These gages are very simple in nature, the plugs being the



Accumulated lead on this leadscrew is checked at Gould & Eberhardt by combining a Zeiss measuring machine with a Pratt and Whitney Electro-limit gage. Standard tolerances for accumulated lead error are 0.0003 in. in any 6 in., 0.0005 in. in any 12 in., 0.0007 in. in any 24 in., and 0.0010 in. in any 48 in. Runout limit is 0.0005 in. per foot. Screws to closer tolerances are produced on special order. Drunken thread error is checked by indicating thread on the lathe during chasing



An adjustable ball gage, including a dial indicator, is also used to measure lead for any desired length. Bar is spotted to the basic dimension, gage is set to bar, and finally, thread is measured for deviation from standard. Ball must be proper diameter for thread being checked

threaded counterparts of the prescribed limit for internal threads, and the rings being internally threaded counterparts of the prescribed limits for external threads. These gages most closely approximate assembly conditions and most detailed specifications are based on this style.

Other limit gage styles include thread snap gages which have members consisting of conical points or serrated or threaded blades, plates, or cylinders which are adjustably mounted in a snap gage frame. These are more readily measured (because external methods may be used) and somewhat faster to use than a ring gage, but they require more care in setting.

Projection comparators are also widely used as limit gages. By the use of a work support and a chart representing and magnifying the limits of size, the principle of limit gaging is available in an optical projection system. The same comparators, properly equipped, may be used for indicating gaging or as direct measuring instruments.

Indicating gages are used to *measure* by electrical, optical, mechanical, or other means the dimensions, deviations, or variations in thread dimensions as specified. Peculiarly suitable for precision, reference, and automatic gaging, indicating gages are widely used for limit gaging as well. Human error frequency can usually be reduced as compared to checking with fixed-size gages. Indicating gages minimize the gagemaker's tolerance and the wear allowance factors which with fixed-size gages may reduce the maximum available product tolerance.

Equipped with a wide variety of contact elements, indicating gages are designed to provide information as to apparent size of thread or as to variations in individual thread elements. In all of these designs, one of the contact elements is movable and actuates a lever system or other means for magnifying its motion and registering its position with respect to a graduated scale, signal lights, or other device.

Gage accuracy is controlled by accurate measuring methods or by master gages. Most products accepted by gages of one style will be accepted by other styles. Nevertheless, parts whose dimensions are near either rejection point may be accepted by one style and rejected by another. In case of disagreement, it is recommended that limit plug and ring threaded gages be used that approximate the extreme product limits as closely as practicable and that all parts passed by such gages be accepted as within tolerance. (The latter gages should be kept for salvage purposes only, after the parts have been previously rejected. Also, they are not suitable for quality-control sampling as they would approve a product limit on the hairline of being scrap.)

Gages are classified by their degree of accuracy, i.e., the amount of tolerance afforded the gage manufacturer or the wear allowance, if any. There are three broad classifications of use:

1. Working gages for controlling production.
2. Inspection gages for acceptance or rejection of finished product.
3. Reference or "Master" gages for determining the accuracy of the working gages or inspection gages; also "setting" gages.

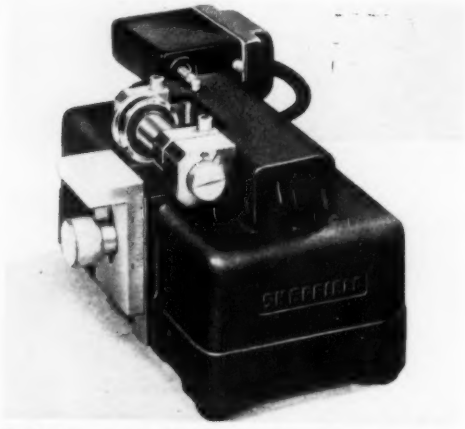
Screwthread gages for classes 1, 2, 3, and 5 are classified according to accuracy as "W", "X", and

Squareness of face with thread is measured by this combination of a bench gage, internal thread segments, a yoke assembly, and a dial indicator. This is a rapid and accurate method for accomplishing an otherwise time-consuming job. Same basic tool can be used for other measurements, such as pd, as well

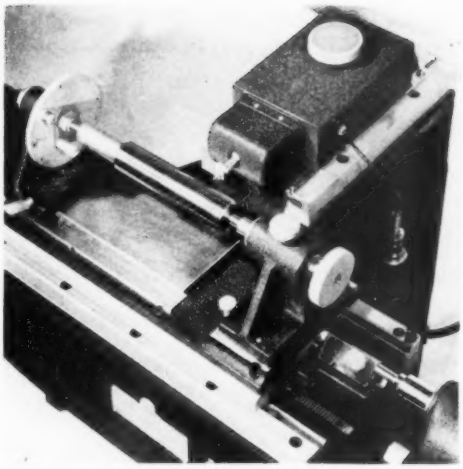
"Y". "W" gages are the most accurate. Tolerance limits on "W" and "X" gages coincide with the extreme product limits. Tolerance limits on Y "GO" gages are placed inside of the extreme product limits to provide allowance for wear. These allowances are equal to one-half of the "X" pd tolerances. "Not Go" gage tolerances are applied from the extreme product limit, while HI and LO gage tolerances may be applied in either direction from the product limit.

"W" gages are used to inspect products of class 5 and, in some cases, class 3 where maximum accuracy is needed. They are also used as setting plugs for full-form class 3. "W" tolerances on lead and thread angle are applicable to all truncated setting plugs.

"X" gages should be suitable for inspection and setting gages for classes 1, 2, and 3, except where the "W" gage is used for full form class 3 gage setting. Tolerances for "Go" gages are such that the gage does not fall outside of the component maximum metal limit. When a thread-plug is used as the "Go" gage for checking a tapped hole, it may be larger, but not smaller than the minimum size specified. Conversely, when a thread-plug is used as a "Go" setting plug for thread-ring gages or for optical or other comparators, it may be smaller, but never larger, than the maximum screw size. "X" tolerances are larger than "W" tolerances and are an economical compromise among such factors as gage cost, amount of product tolerance consumed by gage tolerances, and possible observational errors in the measurement of gages with generally available measuring equipment. These tolerances are usually specified for *all* "Not Go", "HI," and "LO" gages for classes 1, 2, and 3.



Production "Leadchek" is available with either a dial indicator or an "Electrigage" head. This machine utilizes two truncated cylindrical gaging anvils, one fixed and one movable, to measure lead. Both anvils are adjustable for pitch by rotating them on their mounting shafts. Mounting blocks are calibrated to simplify setting. Gage blocks are used for initial setting and accuracy of 0.0001 in. is claimed



"Electrolimit" Lead Tester utilizes gage blocks to set thread length desired, then accumulated lead is read on direct reading headstock. A single thread can be measured without difficulty. Only one ball point is used and seven sizes cover the range of 4 to 80 tpi. Machine includes a sine bar carriage with fixed center, movable center, and indexing plate. Thread is located with an "Electrolimit" head which carries the ball

"Y" gages should be suitable for inspection and working gages for classes 1 and 2 fits, ¼ in. dia and larger. For diameters under ¼ in. use "X" gages. In some cases they may also be desirable as working gages for classes 2 and 3.

Standard tolerances for *plain* plug gages for minor diameter of internal threads and for gages for major diameters of external threads are classified as "Z."

Gages should never be used when they have worn sufficiently to exceed the maximum metal limit, as the gage tolerance and the wear allowance of the "Go" gage are both inside the product limits.

Looseness between mating parts is, to some degree, controversial and arbitrary as there is seldom a distinct line of demarcation in a thread assembly between maximum looseness which may be tolerated and a slightly larger quantity which may not. Preferred practice is that manufacturer's "HI", "LO", or "Not Go", gages be specified within the product limit and common industrial practice is to specify acceptance gages as outside the product limit. Hence, the production of all parts within the minimum-metal limits and acceptance of *all* satisfactory parts is assured. As acceptance gages wear within product limits, they should be discarded or reconditioned when worn to the point where good parts are rejected.

The general rule for gage tolerances is that they be 10% of the tolerance permitted on the product dimensions they are intended to gage.

68 F (20 C) is the standard temperature used internationally for length measurements. Nominal dimensions as specified, and actual dimension as measured, of gages, are to be at this standard.

CONTROL OF SCREWTHREAD ACCURACY

INSPECTION does nothing to improve the accuracy of a product, unless, in a secondary sense, quality control sampling is done during manufacture to maintain the proper dimensional control. The fundamental factors in holding the desired size are the tools used and the processes applied for manufacturing. These must be selected according to the requirements of the particular job at hand and then controlled for the desired specifications. Inspection will only tell you whether or not tools and methods you select are right, it will not directly prevent scrap nor improve the product.

Manufacturing Methods

Screws or external threads are commonly produced by lathe tools, solid or adjustable dies, adjustable or opening die-heads with removable chasers, single- or multiple-thread milling cutters, thread grinding wheels, and roller dies.

Of these, the dies, diehead chasers, some milling cutters, multi-rib grinding wheels, and rolling dies are all multiple-toothed in action. Lathe tools are usually single-pointed and operate in a single thread, which is finished by repeated passes; but multiple-pointed chasers for turning are also available.

Many rolled and cut threads are produced with dies, chasers, hobs, or crush-dressed grinding wheels which, in turn, got their form from master tools, such as hobs, taps, or milling cutters. These master tools are frequently made with form cutters or other tools, but the primary tool is always made with a single-point tool or a single-rib grinding wheel. Angle and pitch errors tend to accumulate in a series of master tools and must be carefully considered in the design and use of this single-point tool.

It is not unheard of for a product thread to reflect a lead error which goes back to a forgotten operation in a distant shop with a lathe having worn half-nuts to engage its leadscrew. Machine-tools, like animals, reproduce themselves—and are equally subject to throwbacks.

Internal threads are commonly produced by either solid or collapsible taps and sometimes by lathe tools. The confined working space makes it particularly difficult to watch the tool progress and cutting action, as well as to inspect the completed thread. Hence, it is extremely important that all process conditions be right before starting.

Thread-element accuracy is a function of:

Angle—By the angle between, and contour of the cutting edges of the tool used for cutting, or of the sides of the grooves in the die used for rolling.

Lead—By the rate of the longitudinal motion of the tool with respect to the rate of revolution of the part to be threaded. This may be controlled by a leadscrew or by leading teeth on a chaser. On rolling dies, lead is controlled by the groove spacing in the die; also by heat-treatment after cutting.

Major diameter of external thread—By stock OD, or by a forming tool if stock OD is touched.

Minor diameter of internal thread—By hole diameter in the work prior to threading. In the case of a drilled hole, this depends on the diameter and accuracy of grinding of the tap drill used. Also, a reamer may be necessary.

Pitch diameter—By radial setting of the forming surface of tool or grinding wheel. On rolling dies, tooth form in the die, the rolling pressure applied, and particularly, the blank diameter.

Thread form—By the form and position of the tool and the conditions under which it is used; also the tool's ability to cut cleanly.

To control tooth outlines, inspection of the angle and profile of the thread-forming tool is essential. All threading tools, regardless of how applied, must produce the proper tooth profile on an axial section of the work. This is the final test of accuracy, for any threading tool. There can be no argument when the produced thread measures or compares exactly with the desired specifications.

Lead-error control requires special consideration, and for this purpose screwthread production methods may be considered under two headings, namely, leadscrew threading and tools which are self-leading.

When a thread is cut by a lathe or other machine which utilizes a leadscrew and a single-point cutting tool, single-form milling cutter, or single-rib wheel, progressive lead errors are caused by:

1. A progressive lead error in the leadscrew.
2. Lack of parallelism of the motion of the cutting tool, the leadscrew axis, and the axis of the part to be threaded.
3. Incorrect ratio of the rate of spindle revolution to that of the leadscrew, because of an incorrect or approximate combination of gears.

Local lead errors are caused by:

1. Local lead errors in the leadscrew.
2. Lost motion in the action of leadscrew or connecting mechanism.
3. Varying frictional resistance in the mechanism.
4. Irregular play of the live center (when used) spindle in its bearings.
5. Variations in the quantity of metal removed by the cutting tool.

Periodic lead errors are caused by:

1. Periodic lead errors in the leadscrew.
2. Eccentric leadscrew motion.
3. Spindle or leadscrew thrust bearing runout.
4. Variations in gear-tooth spacing, or eccentric gears or mountings.
5. Eccentricity of motion of live center spindle (when used).
6. Periodic variations in the amount of metal removed, resulting from non-uniformity of the material in diameter, straightness, or physical properties.

When a multiple-toothed threading tool is controlled by a leadscrew, variations from correct spacing of the teeth of the tool are superimposed on any lead errors resulting from the above causes in that portion of the thread not passed over by every tooth of the tool. In the portion of the thread completely passed over by the tool, the combined effect of leadscrew and tool errors results in a thin thread.

The simplest test of a machine's ability to cut an accurate thread is to set up the machine as carefully as possible and then cut a sample thread. Measure the lead error of the sample screw and then make any corrections necessary to achieve satisfactory function.

Self-leading threading tools present a different set of problems and lead errors may occur as a result of:

1. Incorrect lead of tap or die.
2. Too much or too little relief at the throat of the die or on the chamfer at the end of the tap.
3. The setting of an adjustable die or tap chaser to cut a thread considerably larger or smaller than that for which the tool was intended—to cut a helix angle considerably different from the helix angle of the chaser.
4. Excessive resistance to longitudinal motion.
5. Improper alignment of the tap or die axis with that of the work.
6. Excessive angle relief.

For especially accurate work it is very good practice and sometimes mandatory that the feed of the tap or die be controlled by a leadscrew.

Control of accuracy in the tap or die lead is the most difficult of these sources of error. First, there is the problem of cutting the tap, or chaser, free from lead errors, and secondly, there is a problem of distortion during hardening. The latter is avoided by grinding the tap or die from solid hardened stock or by cutting the tools on a lathe which provides a lead-variating device for compensating in advance of heat-treat for known material changes.

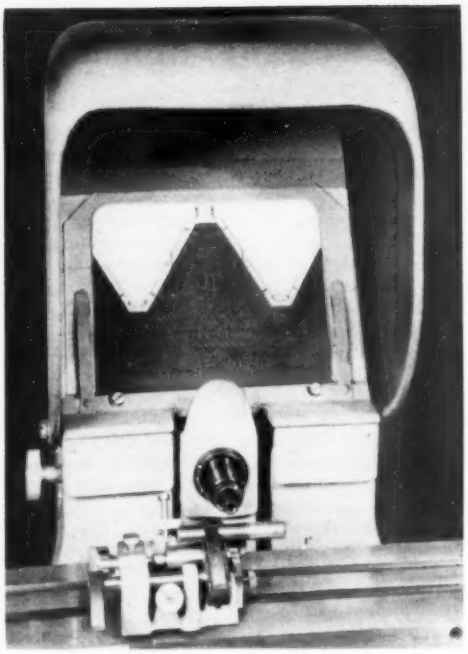
Threading tools can usually be checked by the same analytical methods used for the threaded products and their gages. When measuring the lead of a die-head chaser, it must be fixtured in such a position that the direction of measurement corresponds to the direction of longitudinal motion when cutting a thread.

Common cut-thread errors

Taps are likely to cause bellmouth at the thread start if there is any misalignment between tap and workpiece and both are rigidly held. Thin walled tubing and soft materials may be threaded oversize if tap is forced. Off-lead taps will produce off-lead internal threads and if the tap is forced, threads may be shaved thin.

Chasers will produce eccentric threads if work and tool are improperly aligned. If chaser is ground on, or below, center, or if machine bearings "cam," threads may be out of round or wavy. Rough threads will result from excess surface speed, insufficient or poor coolant, improper hook angle, or short chamfer. Shaved threads are caused by a too-heavy diehead, a binding threading spindle, or, when using a leadscrew, it is not synchronized with the spindle.

Taper or shaving on the first thread is usually a result of poor alignment; or, on brass, cast iron, malleable iron, or aluminum, a surface speed too slow.



Bench comparator (optical) set up for checking threads with a tolerance outline chart and a universal screw stage. Master gage is first mounted in stage to establish correct relationship between chart and stage. Master represents a perfect screw in a perfect nut when properly registered. Then production screws are substituted for master gage; given 100% inspection

Typical tolerance outline thread chart for use on an optical comparator. Lines show basic dimensions; plus and minus tolerances. Charts are available to standard specifications for many thread forms, including: American National, Whitworth Standard, International Metric, and Unified Screwheads

ANALYTICAL INSPECTION

DIRECT measurement of each individual element of a screw thread is often necessary. This is the only way to ascertain that a screwthread is exactly as specified, or the quantity by which any one element is out of specification. Practically all master gages and setting gages must be inspected by this method. Some special manufactured product screwthreads are also inspected in this manner. These are usually maximum strength or quality components such as the threads required at critical locations in aircraft.

Threading tools are also measured and inspected by the methods and equipment described herein. It is essential that these be according to specification before the thread is started.

Slow, but sure

Analytical inspection is fundamentally a slow process. It should never be used when a functional inspection for assemble-ability will provide an adequate qualification. When analytical methods are required on a continuous basis, the various steps can be arranged in sequence and inspection performed on a "production-line" plan—with each inspector checking one or more elements, according to the time required for each step.

Constant temperature (68 F) rooms are not essential unless measurements are required to millionths of an inch. However, it is always an asset to perform these inspections at a location where the temperature is relatively stable. When the budget can afford it, a constant temperature room is a good investment regardless of the accuracy which must be maintained.

Gages, tools, fixtures, and other instruments used for manufacturing as well as inspection should have the same coefficient of expansion as the part being measured. When this is not possible, an expansion factor should be provided for adjusting the measurement. This should also be considered when a part is manufactured in a shop at 90 F and inspected in a room held at 68 F.

Internal threads are considerably more difficult to measure than external threads. Accuracy is best maintained by carefully inspecting the tap or threading tool and the unthreaded hole before threading is started. The most common way of inspecting individual thread elements is to make a cast of a thread form section. Copper amalgam, dental wax, or plaster of paris are used for this cast.

The thread must first be thoroughly cleaned with a good solvent, then dried carefully. If a corrosion inhibitor is not available or the cast tends to stick, the part can be brushed with a thin layer of grease (very thin mix of gasoline and Vaseline). This grease coat *must* be thin and as uniform as possible.

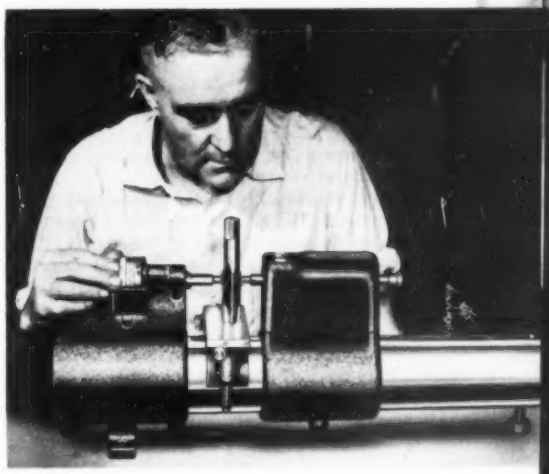
Copper amalgam is heated, pressed with mortar and pestle, and then worked into a plastic state. Excess mercury can be squeezed out with a piece of chamois. A dental tool is used to work small quantities of the amalgam into the thread until the cast is built up. Then it is allowed to set for a time before it is removed. A sharp rap on the part will ease removal of the cast.

Dental wax should not be melted and poured in, but softened in warm water and pressed into the threads with the fingers. Warm the gage slightly to prevent sudden chilling of the wax.

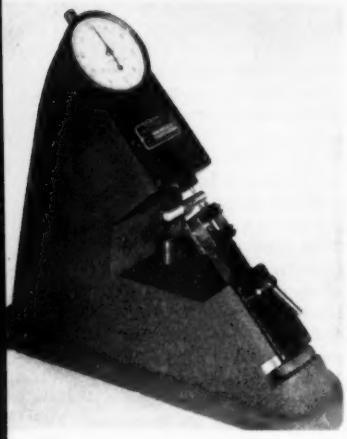
Plaster of paris must be used with a corrosion inhibitor added to the water to prevent corrosion of the part. 1½ oz of potassium dichromate ($K_2Cr_2O_7$) per qt of water will serve this purpose. The cast is made by clamping the part between two plates with the upper half of the threaded hole exposed. A bolt may be inserted headfirst to facilitate removal and handling. The plaster is mixed with water until the resulting mix flows easily (50 grams of plaster to 40 cc of liquid provides a good mix for most threads —slightly thinner for very fine threads). Then the plaster mix is poured into the hole until the maximum depth equals about ¼ of the ring diameter. Pull the cast immediately after it solidifies and inspect at once. Plaster of paris casts will generally hold their form for about ½ hr after hardening.

A fourth way to reproduce the internal thread form is by means of a soft lead piece placed against the threads and pressed, with a mandrel in a vise, into the thread. This is not as accurate, but is very rapid and easily accomplished.

The casts and lead form are inspected by the same methods used for ordinary external threads. When



Checking the pd of a 4-fluted tap using the 3-wire method and a supermicrometer. Wires should never rest on anything during actual measurement, or accuracy may be affected. Most threading tools can be measured by the same equipment and methods as part threads and gages. Supermicrometer is a very accurate and useful all-around measuring tool; measures directly to 0.0001 in.



Gage for checking pd of threads up to 1 in. Ball anvils minimize error resulting from cocking or eccentricity. Lower anvils are mounted on independent pantograph springs which allows proper seating in thread V. Different sets of ball anvils should be used for different pitch ranges

placed in the projector, the cast must be adjusted until the thread image is horizontal. To adjust for the helix angle the cast is rotated until the thread shadows are as narrow and sharp as possible.

Thread diameters cannot be measured by use of the cast and these elements are particularly critical in internal threads. One method is to measure the major and minor diameters, check the angle with a cast, then estimate the pd. Two measuring devices are available to check the pd. One is the Bath super internal thread micrometer and the other is the Bryant bench gage with internal segments. Both provide a pd measurement influenced by lead and angle, but they are the closest tools to the desired instrument. Both tools represent a major step forward.

Generally speaking, all thread forms can be measured by similar methods and equipment. In certain instances, special characteristics of a thread element peculiar to an individual form may require a variation in method. Also, there are at least two methods for checking every element.

For a full discussion of thread inspection practice, plus all of the necessary tables, see:

SCREWTHREAD STANDARDS FOR FEDERAL SERVICES—1944—Handbook H-28, plus its 1950 supplement, prepared by National Bureau of Standards, U. S. Dept. of Commerce, and sold by: Supt of Documents, U S Govt Printing Office, Washington 25, D. C.; price $1.

AMERICAN STANDARD SCREWTHREAD GAGES AND GAGING—ASA B 1.2, sponsored by the SAE and the ASME. Published by the latter at 29 West 39th St, New York 18, N. Y.

MILTIARY STANDARD GAGE INSPECTION (MIL-STD-120, 12 Dec 1950), prepared by the Department of Defense, USA; sold by Supt of Documents, U S Govt Printing Office, Washington 25, D C; price $1.

SPECIFIC METHODS FOR EACH ELEMENT

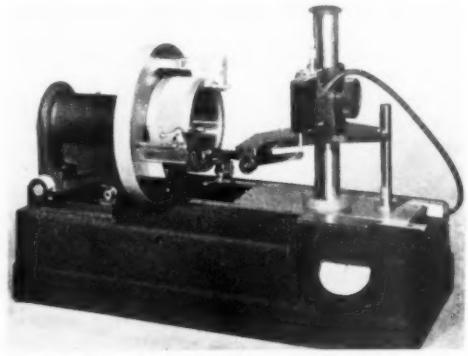
Accurate measurement of thread lead is more important than measurement of all other elements, including pd. Each 0.0001 in. of lead error in a 60° thread causes an inaccuracy in fit equivalent to a pd error of 0.00017 in. Values for pd will not have much significance unless lead is strictly within tolerance. Lead error is the error at the point where there is the greatest plus deviations added to the error at the point where there is the greatest minus deviation.

Although lead, pd, and angle errors are theoretically interdependent, and pd tolerances are cumulative, it is not general practice to take this factor into account except in borderline cases. If lead error is near the maximum tolerance limit, the part should be accepted only if pd and angle errors are well within their tolerance. The part is rejected if pd is near its maximum limit, if the angle is near either limit, or if both of these are as much as one-half of their tolerance limit, respectively.

Lead is measured with a precision lead-testing machine or with an optical comparator. The latter may only be used when it contains a precision measuring device. Measuring error within a lead-testing device must be less than 0.000040 in. for accurate analysis. Readings for lead error are usually taken about six or seven places in each inch of thread length.

Some lead-measuring instruments determine the lead by registering variation in the distance between thread flanks in a line parallel to the axis of the threads. It is seldom possible with these to obtain true alignment between the thread axis and the line of motion followed by the measuring head as it moves from thread to thread. For this reason, take two sets of readings 180° apart on the part circumference and average the lead errors found in the two measurements. If the precision comparator on the lead checker registers variation in a line parallel to the gage axis, instead of parallel to the thread axis, this double set of readings is unnecessary.

Thread angle may be checked with a test tool, an



Ring checking gage is used largely for checking lead of internal threads. Faceplate is raised to horizontal position and ring is centered, then locked in position with three clamps. Face plate is lowered to vertical position resting on a sine bar surface in the case of a straight ring or a gage block build up for a tapered ring. Reading is taken through a ball-point on an "Electrigage" indicator

optical comparator, or a toolmaker's microscope. The test tool is a glorification of the thread gage or templet. It consists of a precision ground test tool or cone point, correction spacers, and a light box. The test tool is pushed into the thread "V" with the piece suspended between centers over the light box. The tool and thread are viewed through a 7-power jewelers glass or a microscope. Each half-angle of the thread is checked individually by rotating the plug enough to bring each thread flank against the tool edge. If any light shows between the tool and the thread flank, the basic tool is replaced with one of a slightly different angle or a correction spacer is inserted. This is repeated until the light is cut off. The dimension of the tool used indicates the thread angle and any error. This method is very accurate and most satisfactory when the helix angle is greater than 6°. Another accurate method of checking thread angle is the use of a toolmaker's microscope equipped with knife-edge contacting members, using the same principle as the test tools.

To inspect the angles of a threaded part in an optical comparator, the part is mounted between centers of the comparator and *the table is rotated through an angle equal to the thread helix angle.* The angle error is obtained by rotating the screen or projection plate until one of the 30° lines is parallel to the image of the thread flank. The angle error is determined by reading the vernier scale at the side of the screen.

Helix angle for any thread is determined by the formula:

$$\tan S = \frac{L}{\pi NE} = \frac{1}{\pi E}$$

where:

S = helix angle
L = thread lead
E = pitch dia
N = number of threads

Of course, a screwthread has several circumferences, therefore several helix angles. However, the helix angle at the pd (which is about the diametral average) is commonly the standard.

The thread flank angle as observed in an optical comparator is not the true angle because the included angle of American National threads is defined as 60° in the axial plane, whereas the projector projects an image of the thread in a plane normal to the helix. A correction factor is required when measuring the angle of a precision thread by means of an optical comparator or by means of a toolmaker's microscope which does not have knife-edge angle checking members. The formula for this correction factor is:

$$\tan a' = \tan a \cos s$$

where:

a′ = half-angle of thread in plane of projection
a = half-angle of thread in axial plane
s = helix angle

Tables are available which give the values of a vs a′ for most commonly used helix angles.

Thread root can be checked at the same time that the angle is checked by using the optical comparator to measure the distance between the lowest points on the straight surfaces of the thread flanks. A special marked screen may also be used on the comparator to indicate the distance specified for the proper root width. The toolmaker's microscope may also be used to measure between the two points. Another method is to provide a special test tool with a point truncated to have a flat equal the maximum permissible width of root. This is checked with a light box and a loupe or microscope.

Pitch diameter is the most important element determining thread fit. The most satisfactory method for measuring the relative positioning of the thread flanks across the diameter of externally threaded parts is to measure over three precision wires placed between the thread flanks. (Two wires are used for measuring taper threads and four wires for multiple start threads with an even number of starts.)

A thread micrometer may be used for rough measure of pitch diameter only, unless the spindle is zeroed on a standard blank of the same size as the pitch to be measured. When the micrometer is set to read zero with the spindle and anvil together, the reading over the threads is slightly distorted. The point on the spindle could be used for any pitch but the V-shaped anvil is limited in range. For this reason, six different micrometer calipers are necessary to cover a range of 4½ to 64 tpi in a given diameter range. In any case, measurement over wires is the most accurate means of checking pd. The actual measuring may be done with a micrometer caliper, a supermicrometer, or a mechanical or electrical indicating comparator set to gage blocks, depending upon the degree of accuracy required and the equipment available.

The best size of wires to use for this measurement is that which will contact the thread flanks halfway along their length (as referred to the fundamental thread triangle). Such wires eliminate the effect of angle errors. Wires which contact the thread flanks along the pitch line are known as "Best Size Wires".

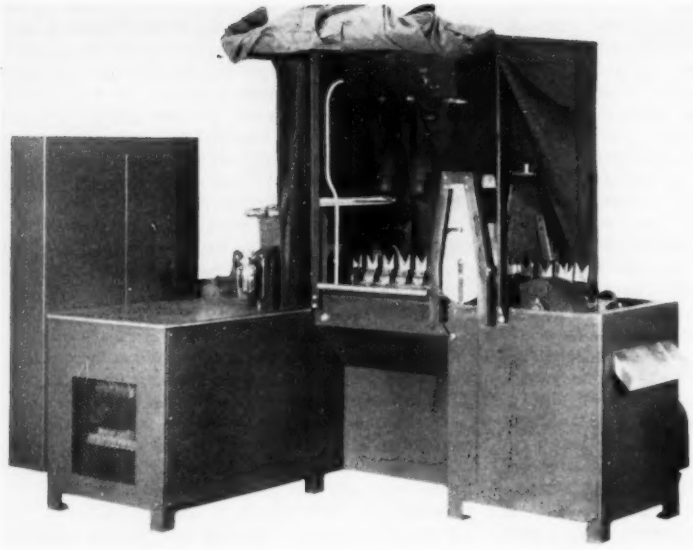
The formula for determining the "Best Size Wires" is:

$$G = \frac{p}{2} \sec a, \text{ or, for } 60° \text{ threads,}$$

$$G = 0.57735p$$

where: G = wire diameter, p = pitch, and a = half angle of thread.

During measurement the wires must be free to adjust themselves in proper alignment with the threads. No rubber bands, threads, wires, or other supports should bind them. If the wires are held vertically, they should not touch the elevating table during the actual measurement. Measure several points about the gage circumference, record the maximum diameter, and subtract from it the constant given on the container for the wires. The result will be the pd accurate to four decimal places. This should be done at the front, center, and back section of the part. In addition to having the correct wire size, the proper pressure is necessary during measuring. For threads 20p or coarser the contact load is



High speed, automatic, conveyorized magnetic inspection unit will process bolts in two directions (transverse and longitudinal) in a single operation. Device also permits most sensitive "black light" inspection. Following inspection, bolts are demagnetized and dumped or slid into tote bins or onto a conveyor

usually 2½ lb; if finer than 20p use a 1 lb load. Too much or too little contact load will cause an inaccurate reading.

If the best size wires are not available, the pd may be computed by measuring the thread angle, computing the helix angle at the point of contact of the wire to be used, and calculating the pd. However, wire may be off by a few thousandths and still be satisfactory without special calculation.

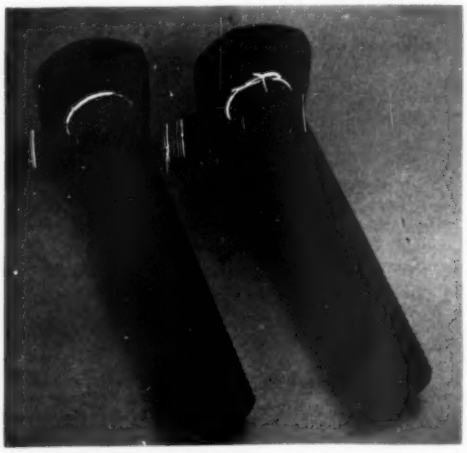
Sometimes taps have an outside diameter over basic and the minimum wires which should be suitable may not project above the tops of the thread.

Taper thread pd is measured over two wires by placing one wire at a given point along the diameter and then taking the average of two measurements made with the other wire in two different positions, each position a distance of P/2 above or below the point where the pd is being determined. The time required to measure the pd and taper of tapered threads can sometimes be shortened by the use of a thread checking fixture.

Major diameter of externally threaded parts should be measured at the front, center, and back by means of a precision measuring instrument such as a micrometer, supermicrometer, electrical or mechanical comparator, or a measuring optical comparator. If an instrument contact point is too narrow to measure efficiently, a gage block should be inserted between the thread and the contact point. On internal threads the major diameter can be obtained by taking the thread height from a cast and adding to it the minor diameter as measured by a plain internal micrometer.

Minor diameter of externally threaded parts is most easily measured with an optical comparator or projector. It can be measured by mounting the part on two knife-edges (which contact the root only) and using a third knife-edge as the contact point in an indicating comparator. For internally threaded parts use precision internal micrometers, gage blocks with accessories, or adjustable limit gages.

Concentricity of pd with major diameter is important on external threads; of pd with minor diameter on internal threads. Concentricity of the major and pitch diameters can be checked with three



Magnaglo shows non-visible heat-treat cracks under head of large hold-down bolts (1½ in. dia) for industrial equipment. Photograph is taken under "black-light" and appears as it would to the inspector. Transverse flaws of this nature, or in threads, are extremely dangerous. Longitudinal flaws in studs or bolts are not as serious

measuring wires by standing two wires on one side of a V-block and one wire on the other side, parallel to the part ends. Place the part on the wires and rotate it with an indicator gage in contact with the major diameter. For checking minor and pitch diameter concentricity in internal threads, the simplest method is to use a Bryant bench gage with internal thread segments and indicators set for checking concentricity. If this is not available, a full-form thread plug gage is threaded into the hole until all but 1½ threads stand above the face. Then the part is checked on a face plate and indicated dead-true by running a test indicator over the major diameter of the protruding thread on the plug. Next, the plug is removed and the indicator used to check the minor diameter. There should be no appreciable runout.

Thread form can be checked roughly by the use of a simple sheet-metal templet, a light box, and a magnifier. More exact checking requires the use of an optical projector and scaled-up templets. It is more practical to check thread form along with the observations made of individual elements earlier in the inspection.

Surface finish is very difficult to measure accurately on a screwthread. On very coarse pitch threads it might be possible to get a fairly accurate reading with a surface analyzer or Profilometer, but the usual practice is to estimate the finish by comparison with surface finish standards. A jeweler's glass (loupe) of about four power is used to facilitate comparison; also show up chatter marks, cracks, burrs, scratches, unfinished spots, or other surface irregularities.

Hardness is also difficult to measure and, although Rockwell and Scleroscope methods are used in some instances, the usual practice is a "file hardness" check. Careful hardening procedure is a better guarantee of a satisfactory product. This, and other metallurgical characteristics can only be properly examined when samples are taken from each job lot and physically tested to destruction.

Structural quality is usually examined by magnetic particle methods. This will show up heat-treat cracks, laps, pickling and plating cracks, tears, and seams. On bolts, transverse defects are much more serious than longitudinal defects. The latter are only serious on bolts subject to torsion loads in service. Nuts, on the other hand, are not passable with either direction of defect. A longitudinal defect will cause a nut to split under the bursting force of tightening.

Transverse defects are detected by means of longitudinal magnetization; longitudinal defects are indicated by circular magnetization. Equipment is available for automatically magnetizing pieces in both directions; conveying them, through the solution, to the inspector; then demagnetizing, rinsing, and depositing them in a tote box or basket. Portable and stationary units are manufactured. Originally, either dry, powdered magnetic iron oxide was used or the powder was suspended in kerosene. The part was magnetized and then either dusted with the powder or rinsed with the solution. More recently a powder was introduced which fluoresces when exposed to "black light" (ultra-violet) and provides more sensitive indications. Magnetic inspection of bar stock prior to threading is practical.

SALVAGE TECHNIQUES

When a part is rejected by manufacturing or "final" inspection, is it really scrap, and if so, how will you dispose of it? Will you throw all of those man-hours into the furnace for remelt, or can some of the part value be rescued? It is well worth consideration!

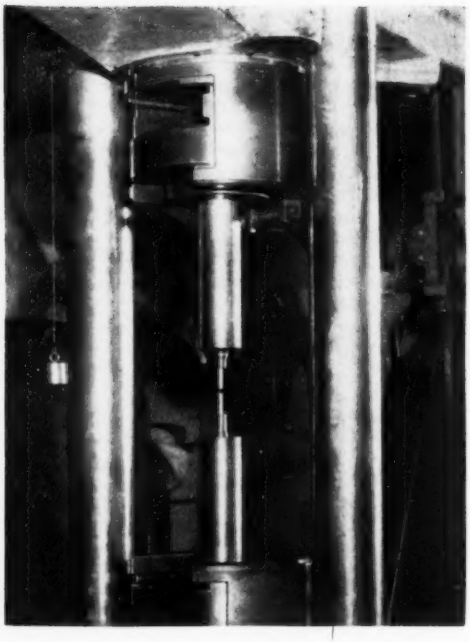
Every manufacturing organization should include, at the highest inspection level, a salvage section. When a part or assembly is rejected anywhere in the plant, for any reason, it is sent to salvage inspection. A tag or marker should be attached to show what the fault is, what the correct condition should be, and the probable cause. Some people even include maintenance parts.

Several methods of disposition are open to the salvage inspector and his word should be final when his decision is made. First, Salvage Inspection should have complete facilities for thoroughly examining the part, including a full set of gages to full tolerance limits. These should be checked often and reconditioned or replaced when even slight wear is apparent, otherwise the gage purpose is defeated. Also, the inspector will need complete facilities for analytical inspection. Of course, he may share this with the normal inspection function if the workload does not call for the use of duplicate equipment.

As received at salvage, the part is thoroughly cleaned and wiped with light oil, or other corrosion inhibitor, if necessary. Then it is checked for maximum limits. If the dimensions fall within the limits the part is returned to the shop for manufacturing. Parts which fall outside of the limits, or any limit, are segregated in terms of plus, minus, and complex or irregular errors.

Every element and condition must be assigned limits, including hardness, straightness, strength, and structural quality. Some limits can only be satisfactory or negative. In almost every salvage problem negative limits require the most attention; are most likely to be unsalvageable.

Plus errors on radial dimensions for external threads, or minus errors on internal threads, can usually be corrected by reworking. This might be by rechasing, retapping, remilling, regrinding, or lapping. However, it is important to determine specifically which element is in error. For instance, if pd is oversize, is pd, angle, or lead too great? Or is it a combined error? The amount and location of error must be known before correction is possible, or disposition can be decided.



Tensile tests should be done on random samples taken from lots of satisfactory parts. Fixture must be designed so that load can be applied between head and a nut on threads. Nut must engage at least three full threads

Minus errors on radial dimensions for external threads, or plus errors on internal threads, are not as easily corrected. However, there are a number of corrective measures which can often be applied when dimensions are undersize. Among these are plating, metal spraying, and the use of thread inserts. Selective assembly may also be used for matching accurate parts that will not require replacement during normal service life.

Plating, usually chromium, is used to build up undersize screwthreads in order that they may be reground to the proper size. If the parts are simply hung on a rack or placed in a basket for immersion in the plating bath, the plate will be uneven; build up most rapidly on the external ridges, and only lightly in the root. For more even plating, the parts should first be sandblasted or electrocleaned, then placed in plating fixtures which will support the part in such a way that the thread is encircled by a spiral anode of the material to be plated. Of course, the anode must not touch the thread. Internal threads should have the anode within the hole. By applying a very high current for the first few seconds of plating, and then reducing it to normal, plating will proceed more evenly. Parts having through holes should be positioned so that the electrolyte can circulate through the hole. Internal threads in bottoming holes are extremely difficult to plate unless they are very large. After plating, parts should be thoroughly cleaned and rechecked prior to machining them to the proper dimensions.

Metal spraying is also used to build up a surface which has been machined undersize. It is, in actuality, the "putting-on tool" apprentices are so often teased about. Very fine threads are very difficult to spray evenly, but the coarser sizes can be salvaged in this way. The thread is sandblasted or wire-brushed and then the metal is applied. A more even coating may be applied by mounting the spray gun on a lathe carriage and using the leadscrew to control movement. On very large threads, each flank may be built up individually, but small threads should be sprayed with the heaviest concentration aimed at the root. After sufficient metal has been added, the part is remachined to size. Sometimes only burnishing is necessary to make the thread usable.

One of the most useful devices for salvaging threaded products is the thread insert. It not only corrects errors, but it will often increase the thread strength. Internal threads are always the most difficult to salvage, and the insert is designed for holes. Two styles are available, one is a plug containing a threaded hole and the other is a helical coil of stainless steel or beryllium copper wire which has been rolled to the shape of the desired thread. The plug is used by drilling out the hole containing the defective thread and driving in the insert. The helical coil is applied by first retapping the defective thread with a special oversize tap for the coil size and then inserting the coil with an inserting tool. A slight spring action of the coil locks it in place. The coil distributes loads more evenly than most original threads, hence increases thread strength.

Before any part is salvaged, however, it is important to carefully analyze the cost of correcting the discrepancy against the value of the part.

Acknowledgments

We appreciate the valuable contribution to THREAD INSPECTION provided by the following organizations:

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American Soc. of Mech Engineers
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Bryant Chucking Grinder Co.
The Carborundum Company
The Cincinnati Milling Machine Co.
Eastern Machine Screw Co.
Eastman Kodak Company
Ex-Cell-O Corporation
Farrand Optical Co., Inc.
Federal Products Corporation
Frankford Arsenal
Gaertner Scientific Corp.
Gould & Eberhardt
Greenfield Tap & Die Corp.
Heli-Coil Corp.
International Business Machines Corp.
Jones & Lamson Machine Co.
Landis Machine Company
Landis Tool Company
The Lees-Bradner Company
Magnaflux Corporation
Moore Special Tool Co., Inc.
National Bureau of Standards
The National Machinery Co.
Norton Company
Pratt & Whitney Aircraft Div., United Aircraft Corp.
Pratt & Whitney Small Tools Division, Niles-Bement-Pond Co.
Reed Rolled Thread Die Co.
George Scherr Co.
The Sheffield Corporation
Size Control Co.
Society of Automotive Engineers
Standard Gage Company, Inc.
The L. S. Starrett Company
Taft-Pierce Mfg. Co.
Threadwell Tap & Die Co.
Tinius Olsen Testing Mach. Co.
U. S. Dept of Defense
The Van Keuren Co.
Van Norman Company
Westinghouse Electric Corp.
Wright Aeronautical Corp.

ROUND TABLE

Four Eyes

"Ed, I keep noticing Bill Bowers—his nose was practically up against his scale again today. He needs glasses—and badly. Why don't you tell him?"

"What? And get my head taken off? Nothing doing! Sure, he needs glasses; but that's his business, not mine. All I have any right to be concerned about is whether or not he gets his work done."

"Right—and that's just where the glasses are involved. If it's your responsibility to get work out, then it's your responsibility to see that it's done right, and as fast as possible. If he scraps or slows a job because he can't see, *your* production suffers, Ed."

"But look, Al, a man has some rights! Should I insist on glasses for Bowers, store teeth for Glavis, and a wig for Baldy Jacobs? How a man looks is his business. If Bowers' eyes get so bad he can't do his work right, I can fire him—but if he doesn't want glasses, that's up to him."

"But maybe it's because he hasn't got the cash, Ed. Maybe we ought to provide regular eye exams, and sell glasses at cost—or even give 'em—to the guys who need 'em. We provide safety glasses; why shouldn't we provide 'em to prescription and make 'em easier to wear?"

"What is this: the first step to socialized medicine? This company hasn't got money for specs and ear phones for all the guys that need 'em! Our costs are too high as it is."

"But, Ed, the glasses—and hearing aids, if you insist—might save the company more than they cost. We give them other tools—why not these?"

"Nope, Al, I don't see it. Glasses—and other medical stuff—are the man's own business. If he won't wear 'em, we can't make him. It's like those uniforms for the gals during the war."

"No, it isn't. That was a problem because the uniforms didn't fit and didn't look good—and, worst of all, everybody had to wear the same design. This is dealing with one guy, on a personal basis, for his good and ours."

"But it's still butting into his business . . . "

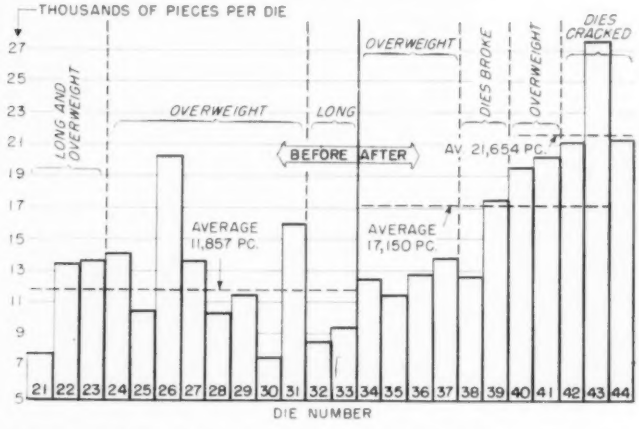
***WHOSE BUSINESS** is a shopman's need for glasses—or hearing aids? Is his pride more important than plant efficiency? Is it worth the money for the company to provide such services? Your ideas and opinions will interest others. Discussions of earlier topics appear on later pages.*

BY R. D. LONG
Chief Inspector, Fort Wayne Works
INTERNATIONAL HARVESTER CO.

QUALITY CONTROL CHARTS

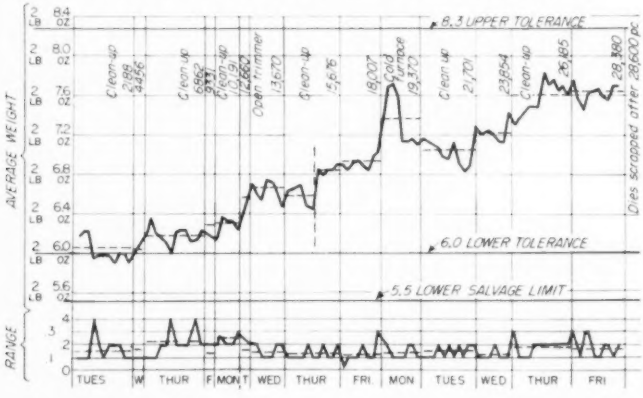
Longer die life, lower forging cost, and higher quality result from quality-control charts that focus attention on trouble spots and help employees find solutions

QUALITY CONTROL INCREASES DIE LIFE 82%



Increased production from dies for forging connecting rods is apparent from time quality control charts first were applied in forge shop. Reasons for scrapping dies are shown at top of chart

DIES ARE SUNK TO PRODUCE MINIMUM-WEIGHT PIECES



Control charts soon proved that cavities sunk to produce forgings weighing more than minimum specified, result in lower die life than should be expected. With die cavity sunk to produce minimum-weight forgings at start of run (condition in above chart), die life can be increased considerably. Originally practice was to clean up dies every 2000 or so pieces. Now improved forging techniques permit running dies for 6,000 pieces or more between cleanups. Result is lower forging cost, improved product quality

Forging techniques have been improved and production costs reduced materially during the four years statistical quality-control charts have been used in the forge shop at International Harvester's Fort Wayne Works. Producing forgings for motor trucks, truck engines, and farm machinery, this shop now makes about 6% more finished forgings per hundred weight of steel than was considered possible before statistical quality-control techniques were introduced.

Using 12 steam hammers (2,500- to 10,000-lb capacity) and several upsetters (up to 6-in. capacity), 175 production workers make about 5,000,000 forgings per month. They range from ½ to 80 lb each. About 500 different parts are forged in quantities ranging from 90,000 per month (when steel is freely available) for truck-engine connecting rods down to as few as 100 per month for some service parts.

As a result of these relatively small job-lots, die changes are fairly frequent, averaging four to five per 8-hr shift. At times there are as many as eight to nine die changes per shift. So shop layout, materials-handling facilities, and billet-heating furnaces are provided on a more flexible basis than if only a few different forgings were to be made in larger quantities. Process control and quality of product therefore are largely dependent upon the skill and job-interest of the men in the department.

Quality of Steel Varies

Today, of course, there is another important factor affecting product quality—the quality of the steel from which the forging billets are made. Where a year ago one could expect the quality

BOOST FORGE-SHOP PERFORMANCE

of a given lot of steel to remain constant, today this is the exception rather than the rule. This factor of material variability is causing many forging difficulties, reducing die life and increasing forging costs.

But quality-control charts on forging operations are helping us discover and solve the problems caused by off-standard billet steels. Charts forced us to study every variable affecting the accuracy and quality of finished forgings. Maintenance of forging equipment and dies soon was found to have a major effect upon product quality. So has die design and die-sinking practices. Control of temperature in billet-heating furnaces is essential—sometimes a change of only 40 F either way will spell the difference between good forgings and scrap.

Flash Thickness Reduced

Studies of allowable flash thickness soon showed that quality could be improved, die life increased, and percentage of yield (ratio of finished forging weight to weight of billet) improved greatly in many instances by decreasing flash thickness. On one small gear forging, for example, production per die was increased from 9,000 to 20,000 forgings by reducing flash thickness from $^1/_8$ to 1/16 in. And billet size was reduced at the same time.

Constant Wear Rate

However, the most important finding, from the standpoint of product cost, probably is the relatively constant rate of wear in the cavity of a forging die. This quickly showed up when quality-control charts were run on forging weights. And it also showed why, when weight tolerances are specified for forging, some dies have a much longer useful life than others. If the cavity of a die is made to the low size of the forging, so it produces a forging weighing somewhere near the lower weight-limit, all other things being equal it will have a longer useful life than a die for the same part sunk so its cavity produces a heavier forging. Control of this one factor has effected greater saving in our forge shop than anything else.

Die Costs Are Lower

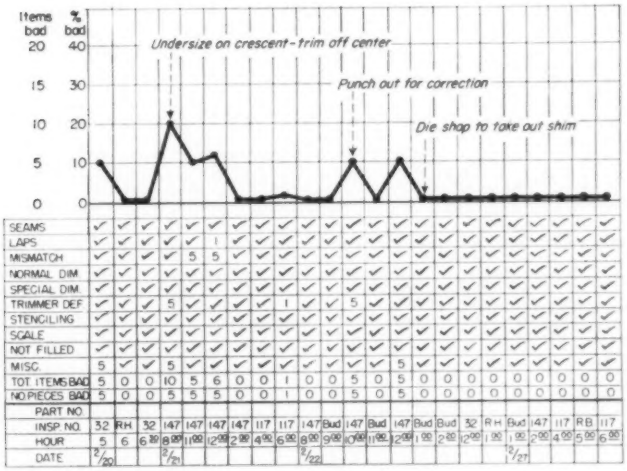
During the three years (1945, 1946, and 1947) preceeding the introduction of quality-control charts in the forge shop at Fort Wayne, die and tooling costs averaged $0.599 per 100-lb of finished forgings. The next year (1948) this average had been reduced to $0.424. Tooling for a new line of trucks increased this value to $0.680 in 1949. But last year (1950), despite higher labor rates and greatly increased materials costs, it was back down to only $0.500 per 100-lb of finished forgings.

Flash ratios, too, are down materially. Average was 17.95% for the years 1945, 1946, and 1947. This value was reduced to 13.89% for 1948, 15.01% for 1949, and 14.0% for 1950. Spoiled-work (scrap) losses were 1.72% for 1945, 1946, and 1947 — they were reduced to 0.70% in 1948, 0.48% in 1949, and 0.18% in 1950. At the same time rework costs were reduced to negligible values. Our works manager has attributed 95% of these and other gains to the introduction and continued use of statistical quality-control procedures.

Cooperation Pays

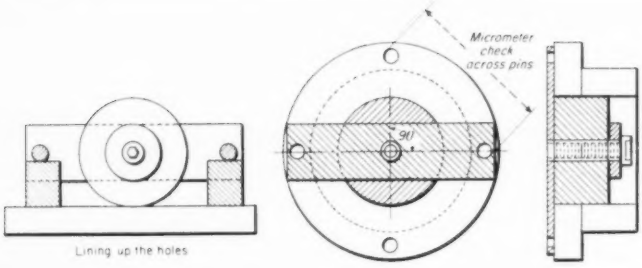
Of course the charts, in themselves, did not make these savings, nor did they improve the product quality. Instead, it took the combined efforts of everyone concerned — production crews and their supervisors, process engineers, die designers and die sinkers, inspectors, and management personnel — to correct the conditions brought to light by the chart. The value of the charts lie only in their continuous surveillance of the product so changes in quality levels can be flagged for analysis when they occur.

NEW CHART BOOSTS FORGING EFFICIENCY



Recently developed chart provides means for recording defects found by forge-shop inspectors during sampling checks. Chart also helps hammermen and supervisors spot ways to improve forging techniques, cut scrap losses, and improve efficiency of department

Practical Ideas



Lining up the holes

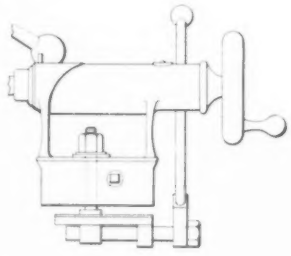
Drill Jig and Micrometer Provide Jig-Boring Accuracy

HAVING TO DRILL four ¼-in. holes, spaced at exactly 90° and on a 3½-in. pitch circle, around the flange of a machined casting, we found a highly accurate way to do jig boring without a jig borer. The method is admittedly slow, but is adequate on small-lot or special jobs.

First we make a square-machined rectangular bar. There are a central hole and two bushing holes exactly on the pitch circle and all directly in line with each other. The central hole is used to assemble a machined plug that will just slip into the bore of the work, holding the bar without play in any direction. The bar is hardened so the holes will not wear.

Set into the work, the bar acts as a drill jig for drilling two opposite holes. These will be exactly opposite if the bar was accurately made. Next, the bar is rotated about 90°, and close-fitting ¼-in. pins are inserted in the drilled holes and in the holes in the bar. A micrometer is utilized to measure the chord across the pins—that is: the correct chord distance is set, then the bar is adjusted to butt its pin against the anvil of the micrometer. This can be checked two ways if four pins are used, two in the bar, and two in the cast workpiece.

Finally, the pins are removed, the bar clamped against the work, and the last two holes are drilled. Any number of holes (if even) can be drilled at accurate chord distances this way. The critical points are making sure the holes are accurately spaced and in line in the bar, the plug fits snugly into the central hole in the work, and the pin holes are exactly the right distance apart. Finding the correct chord distance is simple trigonometry: being the micrometer chord distance on the pitch circle plus the diameter of one pin. *Ben Goodwin, Kentish Town, England.*

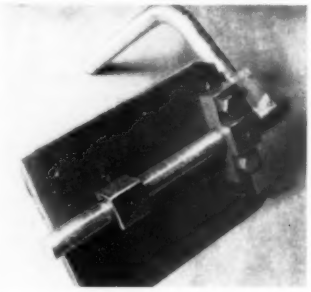


Clamping Plate Locks Tailstock

THIS TAILSTOCK ATTACHMENT was developed for lathes with no tailstock-locking arrangement, of which we have a few. It is just as simple as most tailstock locks, and has more power than many; so is suitable for heavy jobs where pressure on the tailstock is high.

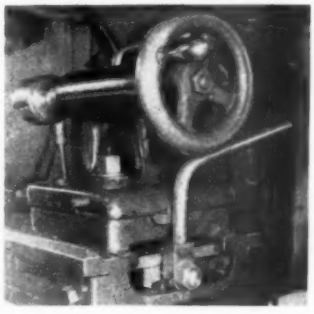
It works on the cam principle. A bolt down through the tailstock casting is fitted with a cam block with an axial hole running through it. The hole is engaged by the cam-turned section of a shaft. The end of the shaft is fitted with a handle that only has to be moved a quarter turn to lock the tailstock on the lathe ways.

A simple bracket at the rear end of the clamping plate—which is machined to fit against the lower surfaces of the lathe ways—supports and locates the camshaft, while the other end of the shaft simply bears against the underside of the plate. When the shaft is

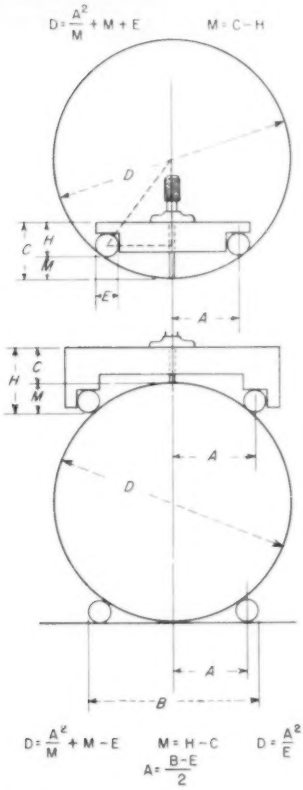


turned—thereby rotating the cam section—the cam block and bolt are pulled, which tightens the clamping plate against the lathe ways. The clamp assembly is illustrated above.

This particular locking plate was



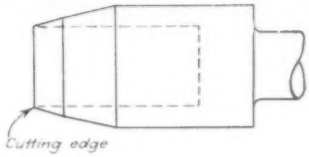
applied to a 9-in. Sheldon lathe; but others are attached to other lathes in our shop. *Walter B. E. Kirsten, Seattle, Wash.*



Geometric Micrometers—Improved

I READ the article on geometric micrometers by O. F. Lambert (*AM* July 23 '51, p 157), and I think the life of the gages could be improved by substituting rollers in a sort of sine-bar arrangement in place of the sharp edges. In addition, I would recommend inserting a depth gage through a hole in each gage body so direct measurements can be made.

However, with a round contact edge, the measuring problem is made more difficult, and a different formula must be followed, as shown in the illustration. Once the gages are made, of course, the value of E will be fixed, as will that of A. M will vary, according to the measurement recorded by the micrometer, but this can be simplified by making the distance from the top of the gage to the bottom of the rollers exactly 1 in. Thus, M would be the exact reading on the micrometer, less an inch. *A. Vetsch, Steffisburgh, Switzerland.*

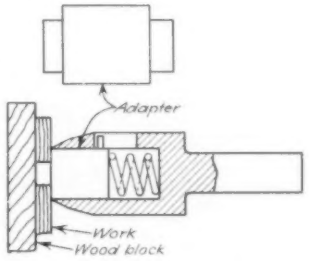


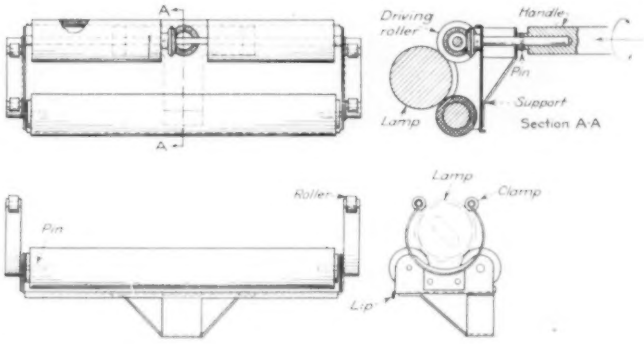
Washer Cutter

CUTTING THE CENTRAL HOLE for leather, felt, or rubber washers is a simple matter; the difficulty lies in cutting the outside diameter concentric with the hole. The job is quite simple, however, with the punch shown here.

The adapter has a pilot at one end which fits into the central hole of the work, and an OD the same as the OD of the work. The punch is similar to an ordinary dinking die. The spring serves to eject finished washers.

If desired, a slot can be cut through the adapter, and a locking pin inserted to prevent it from flying out under the spring pressure. *J. C. Kaiser, Newark, N.J.*



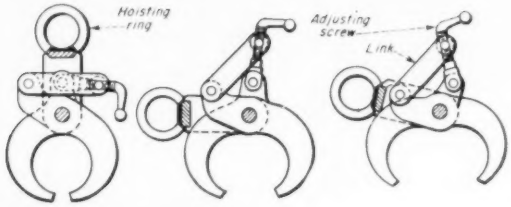


Maintenance Tool Handles Fluorescent Lamps

WHERE COMPLETELY ADEQUATE lamp-maintenance equipment is not available, and where ceilings are low, this roller tool makes replacing or removing lamps easy and much faster. It also provides safety from accidental breakage of the lamps.

It has a metal frame, with stiffening lips, on which two rollers are mounted with shafts parallel to each other. By means of bevel gears, the drive roller is rotated from a long handle that supports the device.

When mounting a lamp, the lamp is inserted between the rollers, lifted to the fixture, and the drive roller is rotated by twisting the handle. Rotating the lamp allows it to engage its pins in the fixture sockets. A tug on the tool, after the lamp is in place, pulls it free. Lamps are same way; reverse order. *Stephen Gerylo, Ottawa, Ont.*



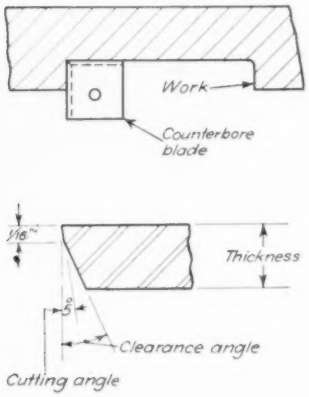
Load Carrier Has Self-Locking Feature

FOR LIFTING HEAVY LOADS with cranes and hoists, this hook is safe and efficient, even where the loads are roughly handled. The critical parts of the device are the adjustable screw and the toggle, which lock the jaws closed when a pull is exerted on the hook.

Both hook arms have extensions past the central holes drilled through them. One, on the right-hand hook, is longer and is doweled or pinned to the end of a link. The other is pinned to a toggle fitting in which the end of the screw rides. The screw passes through another fitting (threaded) that is pinned to the other end of the link. This fitting can swivel.

Assembled to the hook jaws and held by the same pin on which they pivot is a simple hoisting ring.

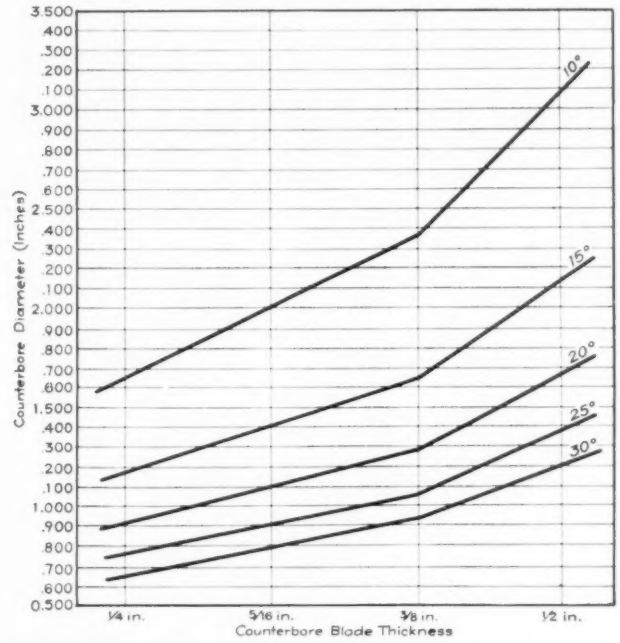
Once the screw is adjusted for the width or diameter of work to be lifted, the hooks are loaded over the work, the screw pulled around and snapped down to lock the hooks, and the load is attached to the hoist or crane. When a lifting pull is exerted—and assuming that the device is correctly adjusted—the jaws cannot release because the toggle fitting at the end of the screw is above the centerline of the link. The jaws can only be released when the lifting load is released so the link can be raised above this fitting by lifting the end of the screw. *D. G. Noble, Wiesbaden, Germany.*



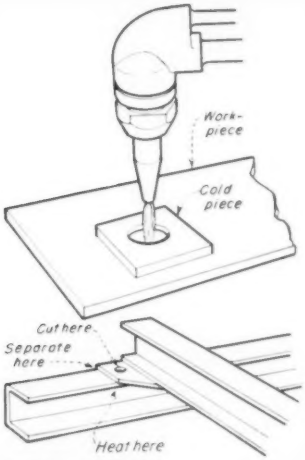
Angle Nomograph Shows Cutter Clearances

CLEARANCE ANGLES on counterbore blades should be as small as possible, to provide maximum blade strength; but at the same time must be large enough to clear the counterbore diameter. The accompanying nomograph can be used to determine the smallest clearance angle that can be used for blades of 1/4-, 5/16-, 3/8-, and 1/2-in. thicknesses.

The left-hand scale denotes the counterbore diameter in inches, the bottom scale is the blade thickness, and the diagonal lines indicate corresponding clearance angles.



To use the chart, locate the diameter to be cut on the left-hand scale, then move across to the blade thickness. The intersection point should be well above the diagonal representing the angle. For example, to cut a 3.000-in. counterbore with a $\frac{1}{2}$-in. blade, it will be necessary to use a 15° clearance angle, but if a $\frac{3}{8}$-in. blade is used, a 10° angle will be satisfactory. *Donald E. Sweet, Marblehead, Mass.*



Cutting Method Makes Clean Holes

IT IS OFTEN NECESSARY in structural work to cut a hole with a gas torch through which a bolt must be passed. A smooth hole, to the right size, is obtained with the following method:

The plate is heated until red with the torch, then a cold plate with a hole the required size drilled through it is placed over the spot where the hole is wanted. The cutting jet of oxygen is blown through the cold piece, cutting the hole in the hot piece, and leaving the cold one untouched.

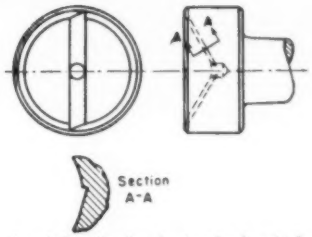
In assembling two plates, one with a hole cut through it, and the other requiring a hole, the plates are positioned, then separated slightly. The whole plate is heated from the back side; then the cutting jet is blown through the already cut hole against the heated plate. The hole cut will be in exactly the right place. *H. Murro, Jerusalem, Israel.*

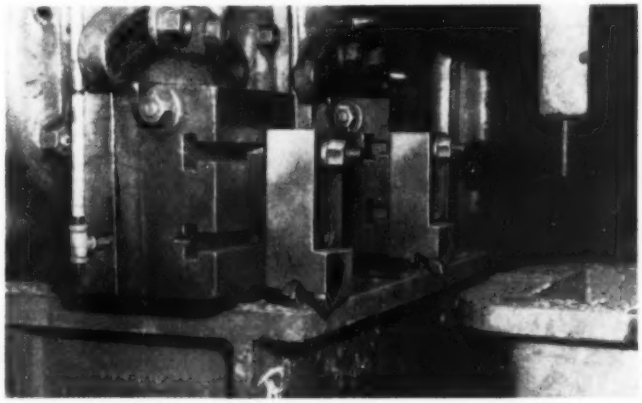
OLD MICROMETERS and micrometer sleeves on machine adjustments can be sharpened up so they can be read as easily as when they were new by painting them with bluing or a similar dye, then wiping off the exposed surfaces to leave dye in the etched and machined index lines. *O. O. Kilbourn, Montebello, Calif.*

Drill Driver Speeds Shank Turning

WHEN WE WANT to reduce the diameter of twist-drill shanks, or cut a special taper on the shanks, we utilize a drill driver that works from the chuck end of the lathe. The cone-shaped end of the driver has two sharp edges, which match the flute edges of the drill exactly. A simple center is used in the tailstock.

This technique allows turning the drill shanks, instead of grinding, resulting in a faster job. *J. M. Askin, Lufkin, Texas.*

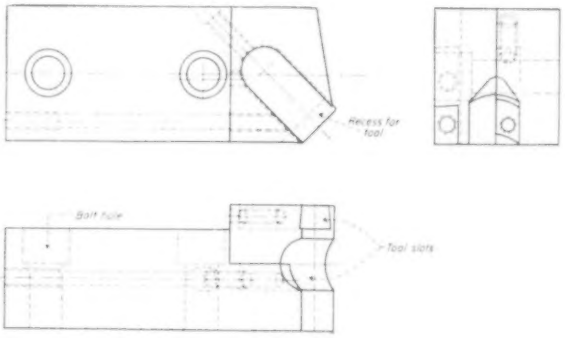




Planer Toolholder Takes Heavy Beating

WE DOUBLED the feed on a job where we were planing gray-iron castings with this toolholder. The cut was intermittent, but was a hogging one, so the toolholder had to be tough.

Carbide-tipped tools were used with a 0.250-in. feed and at 55 sfpm. Depth of cut was from $\frac{3}{8}$ to $\frac{5}{8}$ in. Above, the setup; below, the toolholder. *J. M. Askin, Lufkin, Texas.*



Differential Screws—Speed vs Power

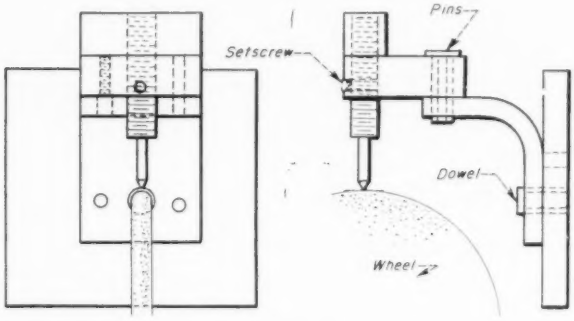
THE INGENIOUSLY SIMPLE arrangement of A. Vetsch in "Differential Screw Has More Power" (*AM*, July 23 '51, p 155) has one snag. It does not work as indicated with one right-hand and one left-hand thread.

If one right-hand and one left-hand threads are on the same screw, turning the screw either separates or draws together two nuts more quickly than normal, but does not increase the *power*. In fact, the reverse is true: power times speed is a constant, so if you have more speed, you have less power.

There is also an error in finding the resultant movement of the two threads. Instead of adding up the threads per inch, you should add the reciprocals of the pitches per inch—thus, 1/16 + 1/11 = 1/6.55. This is a coarse pitch.

The correct arrangement is to cut a right-hand thread of 16 tpi on the cap; thus producing 1/11 − 1/16 = 1/35. The two threads act together as if they were a single thread of 35 tpi, which would be extremely fine for engineering and machine-tool applications. The advantage is that the movement would be 3.15 slower than the ordinary screw, but 3.15 times as powerful. *Paul Grodzinski, London, England.*

Editor's Note: In all fairness to Mr. Vetsch, we must admit that we seem to have misinterpreted his meaning. His letter said "To get a better removing. . . ." Instead of more *power*, he wanted more *speed*, which, as Mr. Grodzinski points out, is what he got.



Makeshift Diamond Swivel Dresses Odd Jobs

MANY SHOPS that are unwilling to invest in a fancy purchased or homemade grinding-wheel dressing device may want to have this sort of simple gadget around for the few dressing jobs that do crop up.

The rig is an easily made one: A simple baseplate is fitted with a dowel that centers a bent plate. The top end of this plate is doweled tightly to a block that carries the dressing tool. The diamond holder can be held in the hole through the block by a setscrew alone, or by threading and the setscrew.

Radii of different lengths are set by shifting the holder back and forward in the block; such adjustments being measured carefully. A micrometer can be spanned across from the tip of the diamond to the back edge of the block. This dimension should be the constant dimension from the center of the plate dowel to the back of the block plus or minus the desired radius. *Edward Diskavich, Torrington, Conn.*

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PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES— A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER - Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

134th Winner:
(For August 6 issue)
D. G. Nolle
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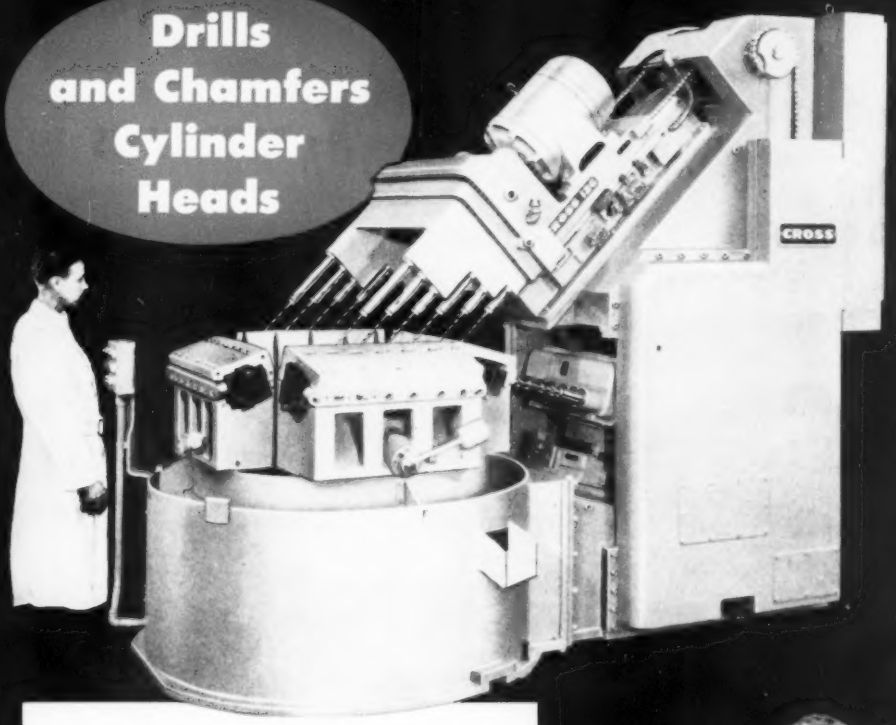
Another Special by Cross

Drills and Chamfers Cylinder Heads



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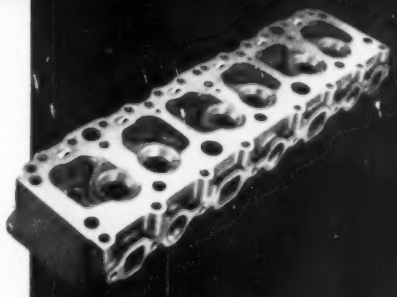
- ★ Other features—J.I.C. standard construction; stranded wire electrical installation; hardened and ground ways; hydraulic feed.



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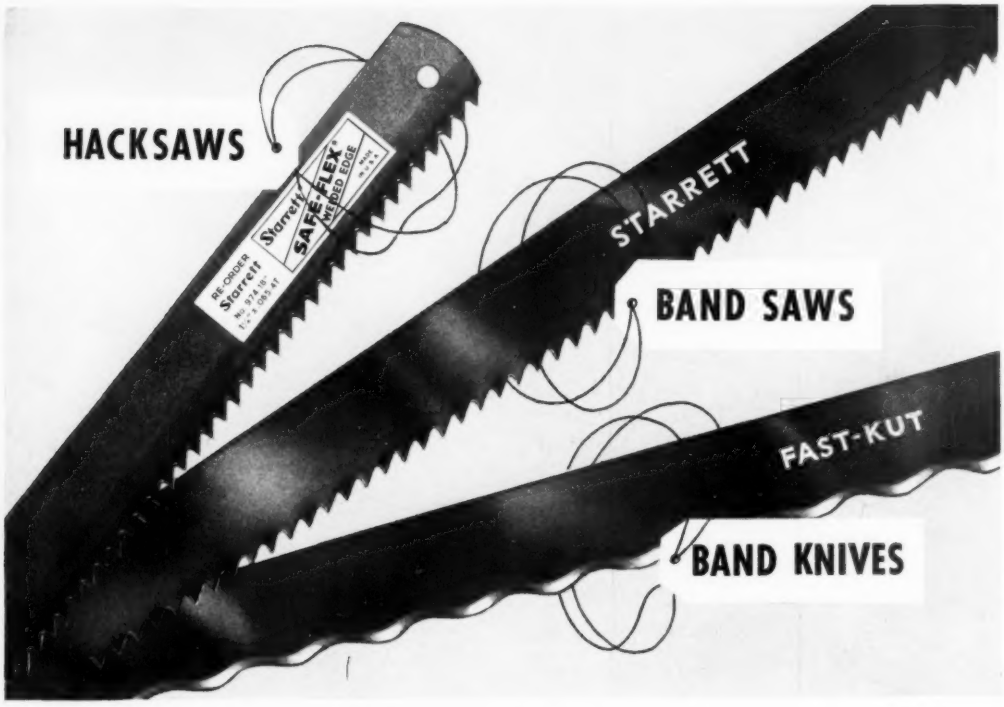

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Stainless-Steel Specifications...I

Compiled by Peter A. Frasse & Co., New York. Government specifications listed are those in force on June 1, 1951

U. S. MILITARY SPECIFICATIONS

Specification		Carbon *	Manganese *	Phosphorus *	Sulphur *	Silicon *	Nickel †	Chromium †	Molybdenum *	Form	Nearest Corresponding Number SAE	AISI	AMS
MIL-S-853 (Ships)	Class 1, Types A,B,C	.08	2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
Amend 1	Class 2, Types A,B,C	.09-.20	2.0	.04	.04	1.0	8.0	17.0	—	Bars	30302	302	5636, 5637
Sup'sedes 46S-18a	Class 3, Types A,C,E,F	.15	1.0	.04	.04	1.0	0.6 Max.	11.5-13.5	0.6	and	51410	410	5613B
	Class 4	.12	1.0	.04	.04	1.0	0.5 Max.	16.0-18.0	0.6	Forgings,	51430	430	—
	Class 5, Types A,F	.30-.40	1.0	.04	.04	1.0	0.5 Max.	12.0-14.0	—	except	51420	420	5620A
	Class 6, Types A,C,E	.15	1.2	See Spec.	See Spec.	1.0	0.5 Max.	12.0-14.0	See Spec.	for	51416F	416	5610D
	Class 7, Types A,B,C	.15	2.0	See Spec.	See Spec.	1.0	8.0	17.0	See Spec.	reforging	30303F	303	5640E, 5641
	Class 8, Type A	.08	2.0	.04	.04	1.0	8.0	17.0	—	(For reforging bars and billets, See MIL-S-862 (Ships) Amend 2)	30321 or 30347	321 or 347	5645E 5646B
	Class 9, Types A,C	.10	2.0	.04	.04	1.0	10.0	16.0-18.0	2.0-3.0		30316	316	5647A
	Class 10, Types A,E,F	.20	0.8	.04	.04	1.0	1.25-2.0	15.0-17.0	—		51431	431	5628A
	Class 11, Type A	.25	2.0	.04	.04	2.0	19.0	24.0-26.0	—		30310	310	5651A
	Class 12	.50	0.4-0.8	.04	.05	0.5-2.0	19.5	6.5	—		30325	325	—
MIL-S-854 (Ships)	Class 1, Cond. A	.08	2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
Amend 1	Class 2, Cond.	.09-.20	2.0	.04	.04	1.0	8.0	17.0	—	Plates,	30302	302	5515B, 5516B, 5517C, 5518B, 5519D
Sup'sedes 47S20(Int)	A,B,C,D,E									Sheets,			
	Class 3, Cond. A	.15	1.0	.04	.04	1.0	0.6 Max.	11.5-13.5	—	Strip and	51410	410	5504A
	Class 4, Cond. A	.12	1.0	.04	.04	1.0	0.6 Max.	16.0-18.0	—	Shapes	51430	430	—
	Class 8, Cond. A	.08	2.0	.04	.04	1.0	8.0	17.0	—		30321 or 30347	321 or 347	5510D 5512B
	Class 9, Cond. A	.10	2.0	.04	.04	1.0	10.0	16.0-18.0	—		30316	316	5524
	Class 11, Cond. A	.25	2.0	.04	.04	2.0	19.0	24.0-26.0	—		30310	310	5521A
MIL-S-861 (Ships)	Class A	.06-.13	0.25-0.8	.03	.03	.50	0.3 Max.	11.5-13.0	—	Bars	51414	414	5615A
Sup'sedes 46S12e	Class B	.06-.13	0.25-0.8	.03	.03	.50	1.0 Max.	11.5-14.5	—	Bars and Strip	51414	414	5615A
	Class C	.07-.12	0.3-0.6	.03	.03	.35	0.6 Max.	11.5-12.5	0.4-0.6	Bars and Billets	51416F	416F	5610D
MIL-S-862 (Ships) Amend 2 Sup'sedes 46S26a	Classes equivalent to MIL-S-853 (Ships) Amend 1	Analyses are identical to those shown for MIL-S-853 (Ships) Amend 1								Bars and Billets (For reforging only)	See MIL-S-853 (Ships) Amend 1		
JAN-P-1144 Sup'sedes 44P16(Int)	Classes A,B,C	.08	.20-2.00	.03	.04	0.7	8.0	18.0	—	Seamless & Welded Pipe and Tubing	30304	304	5560B, 5565B
MIL-S-4043 (USAF)		.03	2.0	.04	.03	1.0	8.0-11.0	18.0-20.0	0.5	Plate, Sheet and Strip	—	304ELC	5511
MIL-S-5059 Supersedes AN-QQ-S-772a	Type D	.12	2.0	.04	.03	1.0	6.5	16.0	0.5	Plate, Sheet and Strip	30302	302	5515B, 5516B, 5517C, 5518B, 5519D 5515B, 5516B, 5517C, 5518B
	Type G	.12	2.0	.04	.03	1.0	8.0-11.0	17.0-20.0	0.5		30302	302	
	Type SCR	.08	2.0	.04	.03	1.0	10.0-14.0	16.0-18.0	2.0-3.0		30316	316	5524
MIL-T-5695 Sup'sedes 48T11		.12	0.7	.03	.04	0.7	7.0	17.0	—	Streamlined Tubing	30304	304	5560B
MIL-W-6713 Sup'sedes AN-W-24	Grade G	.012	0.2-2.5	.04	.04	0.2-1.5	7.0	17.0	—	Wire	30302	302	5685B, 5688B
MIL-S-6721	Composition Ti	.08	2.0	.04	.03	1.0	9.0-12.0	17.0-19.0	—	Plate,	30321	321	5510D
Sup'sedes AN-S-757	Composition Cb.-Ta	.08	2.0	.04	.03	1.0	10.0-13.0	17.0-19.0	—	Sheet and Strip	30347	347	5512B
MIL-T-6737 Sup'sedes AN-T-82		.10	0.2-2.5	.04	.04	0.2-1.5	7.0	17.0	—	Welded Tubing	30321 or 30347	321 or 347	— 5575E
MIL-T-6845 Sup'sedes AN-T-86		.08	2.0	.03	.03	.75	8.0	18.0	0.5	Seamless & Welded Tubing, Hydraulic	30304	304	5566A
MIL-T-6846 Sup'sedes AN-T-43		.08	2.0	.03	.03	.75	8.0	18.0	0.5	Seamless & Welded Tubing, Hydraulic	30304	304	5586A

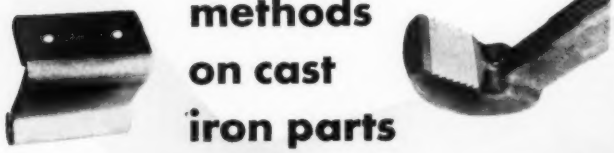
U. S. ARMY SPECIFICATIONS

48-42	Amend 1	.30-.40	0.6	.03	.03	.50	0.5 Max.	12.0-14.0	—	Wire	51420	420	—
48-43	Amend 1	.12	0.2-2.0	.04	.04	1.0	7.0	17.0	—	Wire	30302	302	5685B, 5688B
57-180-3c		.10	0.2-2.0	.04	.04	1.0	8.0	17.0	—	Seamless and Welded Tubing	30321 or 30347	321 or 347	5570F 5571A, 5575E

* Maximum, and † minimum, except where otherwise stated, or the range as shown. For notes on minor constituents, see page 167.

Latest

surface broaching methods on cast iron parts teeth serrations and slots



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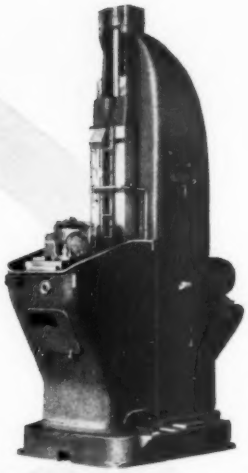
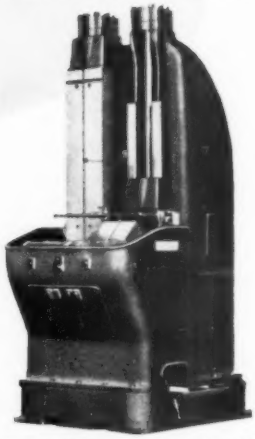
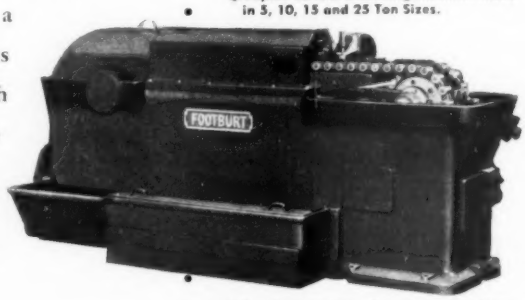


●Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



●Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



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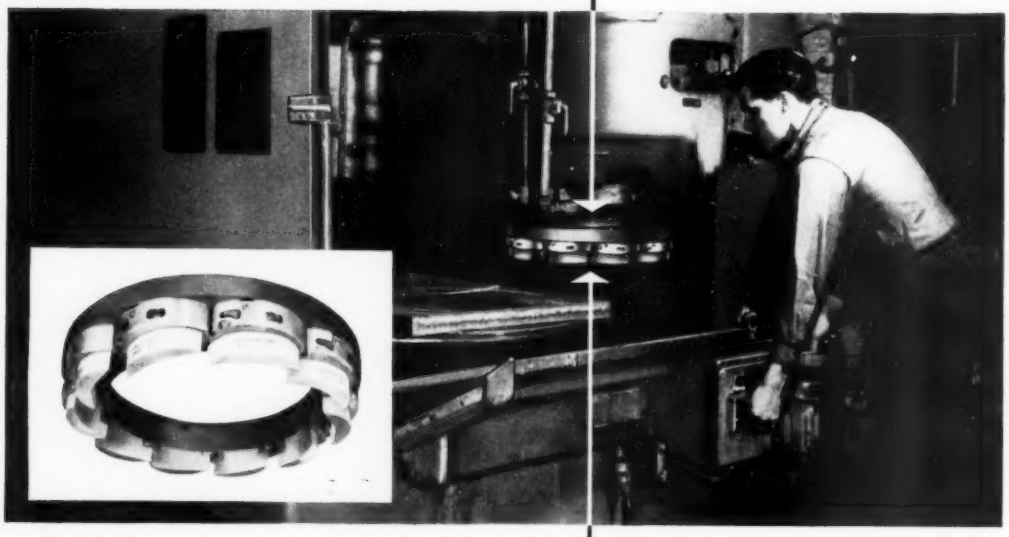
Specification		Carbon %	Manganese %	Phosphorus %	Sulphur %	Silicon %	Nickel %	Chromium %	Molybdenum %	Form	Nearest Corresponding Number SAE	AISI	ASTM
AN-W-23	Grade MCR	.10	0.2-2.5	.04	.04	0.2-1.5	7.0-14.0	17.0	1.75-2.5	Wire	30316	316	5690C
AN-W-24	Grade G	.12	0.2-2.5	.04	.04	0.2-1.5	7.0	17.0	—	Wire	30302	302	5685B, 5688B
AN-T-43	Composition I	.12	0.2-2.5	.04	.04	0.2-1.5	6.5	17.0	—	Welded Tubing,	30304	304	5566A
Amend 2	Composition 2	.10	0.2-2.0	.04	.04	0.2-1.5	7.0	17.0	—	Hydraulic	30321 or 30347	321 or 347	— —
AN-T-82		.10	0.2-2.5	.04	.04	0.2-1.5	7.0	17.0	—	Welded Tubing	30321 or 30347	321 or 347	— — 5575E
AN-T-86		.08	2.0	.03	.03	.75	8.0	18.0	—	Seamless & Welded Tubing, Hydraulic	30304	304	5566A
AN-S-757	Composition Ti	.08	2.0	.04	.03	1.0	9.0-12.0	17.0-19.0	—	Plate, Sheet	30321	321	5510D
	Composition Cb	.08	2.0	.04	.03	1.0	10.0-13.0	17.0-19.0	—	and Strip	30347	347	5512B
AN-QQ-S-770a	Amend 1	.17	0.3-0.8	.04	.04	0.2-0.6	1.5-2.5	15.5-17.5	—	Bars	51431	431	5628A
AN-S-771	Composition G	.12	2.0	.04	.03	1.0	8.0-11.0	17.0-20.0	—		30302	302	5636, 5637
Amend 1	Composition MCR	.10	2.0	.04	.03	1.0	10.0-14.0	16.0-18.0	2.0-3.0		30316	316	5648A
	Composition FMS	.12	2.0	.06	.18-.35	1.0	8.0	17.0-20.0	0.6	Bars	30303F	303	5640E
	Composition FMP	.17	2.0	.12-.17	.10	1.0	8.0	17.0-20.0	0.6		30303F	303	5640E
	Composition FMSe	.12	2.0	.17	.10	1.0	8.0	17.0-20.0	0.6		30303F	303	5640E
AN-QQ-S-772a	Composition G	.12	0.2-2.5	.04	.04	0.2-1.5	6.5	17.0	—	Plate,	30302	302	5515B, 5516B, 5517C,
Amend 1										Sheet and			5518B, 5519D
	Composition MCR	.10	0.2-2.5	.04	.04	0.2-1.5	7.0-14.0	17.0	1.75-2.5	Strip	30316	316	5524
AN-WW-T-855	Amend 2	.12	0.2-2.5	.04	.04	0.2-1.5	7.0	17.0	—	Seamless Tubing	30304	304	5560B
AN-WW-T-858	Amend 2	.10	0.2-2.5	.04	.04	0.2-1.5	7.0	17.0	—	Seamless Tubing	30321 or 30347	321 or 347	5570F 5571A

U. S. NAVY SPECIFICATIONS

22W13d		.10	0.2-2.5	.03	.03	0.2-1.5	7.0-14.0	17.0	2.0-4.0	Wire	30316	316	5690C
46B12e	Class A	.08-.13	0.25-0.8	.03	.03	0.5 Max.	0.5	11.5-13.0	—	Bars	51414	414	5615A
	Class B	.08-.13	0.25-0.8	.03	.03	0.5 Max.	1.0	11.5-14.5	—	Bars and Strip	51414	414	5615A
	Class C	.07-.12	0.3-0.6	.03	.03	0.35 Max.	0.6	11.5-12.5	0.4-0.6	Bars and Billets	51416F	416	5610D
46B18e	Class 1, Type A	.08	0.2-2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
	Class 1, Type B,C,D	.12	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30302	302	5636, 5637
	Class 2	.50	0.4-0.8	.04	.05	0.5-2.0	19.5	6.5	—	Bars and	30325	325	—
	Class 3, Type A,C,E,F	.15	1.0	.04	.04	1.0	0.6 Max.	11.5-13.5	0.6	Forgings,	51410	410	5613B
	Class 4	.06-.15	1.0	.04	.04	1.0	0.5 Max.	16.0	0.6	except for	51430	430	—
	Class 5, Type A,F	.30-.40	1.0	.04	.04	1.0	0.5 Max.	12.0-14.0	—	reforging	51420	420	5620A
	Class 6, Type A,C,E	.15	1.2	See Spec.	See Spec.	1.0	0.5 Max.	12.0-15.0	See Spec.	(For reforging	51416F	416	5610D
	Class 7, Type A,B	.12	0.2-2.0	See Spec.	See Spec.	1.0	8.0	17.0	See Spec.	bars and billets	30303F	303	5640E, 5641
	Class 8	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	—	46B26A)	30321 or 30347	321 or 347	5645E 5646B
	Class 9, Type A,C	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	1.75-2.5		30316	316	5648A
	Class 10, Type A,E,F	.12	0.3-0.8	.04	.04	0.2-0.6	1.5-2.0	15.5-17.5	—		51431	431	5628A
46B26a	Class 1, Type A	.08	0.2-2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
	Class 1, Type B	.12	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30302	302	5636, 5637
	Class 2	.50	0.4-0.8	.04	.05	0.5-2.0	19.5	6.5	—		30325	325	—
	Class 3	.15	0.6	.04	.04	.75	0.6 Max.	11.5-13.5	0.6	Bars and	51410	410	5613B
	Class 4	.06-.15	0.2-0.6	.04	.04	.75	0.5 Max.	16.0	0.6	Billets	51430	430	—
	Class 5	.30-.60	0.2-0.6	.04	.04	.75	0.5 Max.	12.0-14.0	—	(For reforging	51420	420	5620A
	Class 6	.15	1.2	See Spec.	See Spec.	1.0	0.5 Max.	12.0-15.0	See Spec.	only)	51416F	416	5610D
	Class 7	.12	0.2-2.0	See Spec.	See Spec.	1.0	8.0	17.0	See Spec.		30303F	303	5640E, 5641
	Class 8	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30321 or 30347	321 or 347	5645E 5646B
	Class 9	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	2.0-4.0		30316	316	5648A
47B20 (Int.)	Class 1, Cond. A	.05	0.2-2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
	Class 2, Cond. A	.12	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30302	302	5515B, 5516B
	Class 3, Cond. A	.15	1.0	.04	.04	1.0	0.8 Max.	18.0-14.0	—	Plates,	51410	410	5504A
	Class 4, Cond. A,B,C,D,E	.09-.20	0.2-2.0	.04	.04	1.0	8.0	17.0	—	Sheets, Strip and Shapes	30302	302	5515B, 5516B, 5517C, 5518B, 5519D
	Class 5, Cond. A	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	1.75-2.5		30316	316	5524
	Class 6, Cond. A	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30321 or 30347	321 or 347	5510D 5512B
47B22a		.12	0.2-2.0	.04	.04	1.0	8.0	17.0	—	Plate and Sheet	30302	302	5515B, 5516B
47B30	Class 1	.08	2.5	.04	.04	.75	8.0	18.0	—	Clad Plate,	30304	304	—
	Class 2	.12	2.5	.04	.04	.75	6.0	16.0	—	Sheet and	30302	302	5515B, 5516B
	Class 3	.06-.15	0.75	.04	.04	.75	0.8 Max.	15.0	0.6	Strip	51430	430	—
	Class 4	.10	2.5	.04	.04	.75	8.0	17.0	—		30347	347	5512B
49T11		.12-.15	0.7	.03	.04	.70	7.0	17.0	—	Streamlined Tubing	30304	304	5560B

Footnote on page 163 applies for maximums and minimums for chief elements. For minor constituents, see page 167.

New TITCOMB SEGMENTAL CHUCK *SLASHES GRINDING COSTS*



Check the many advantages of this revolutionary new chuck when it is used in combination with tried and proved Robertson Segments . . .

LOW COST. Novel design of segment gives the lowest cost per cubic inch of usable abrasive. By actual grinding tests, three to four inches of metal are removed for every inch of abrasive loss.

FASTER CUTTING. Unique design produces a plowing action. This, plus centrifugal force, sweeps chips and dirt from the work surface.

CONTINUOUS CUTTING. Overlapping segments assure continuous cutting . . . leave plenty of space for chip clearance.

LESS WASTE. Clamping device with safety wedge action and integral segment adjusting plate reduces segment waste. No special skill is required to load the holders.

SIMPLIFIES BUYING. Regardless of the size of the chuck, one size segment covers all vertical spindle surface grinding requirements.

If you are now using Robertson Wheels or Segments, you know you can count on them for top performance. Even so, you will be surprised at the greater production with less cost that this new chuck can give you. If you are one of the few who have yet to experience the tremendously increased output that comes from using Robertson abrasive products, then you owe it to yourself to investigate the possibilities which this new combination offers you. Let a Robertson engineer show you—right in your own plant—on your own equipment. Write on your business letterhead for a demonstration.

Today, some of the country's largest manufacturers are using Robertson Wheels and engineering services.

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

FEDERAL SPECIFICATIONS

Specification		Carbon *	Manganese *	Phosphorus *	Sulphur *	Silicon *	Nickel †	Chromium †	Molybdenum *	Form	Nearest Corresponding Number		
											SAE	AISI	AMS
QQ-S-763a	Class 1, Type A	.08	8.2-2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
Amend 1	Class 1, Type B,C,D	.12	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30302	302	5636, 5637
	Class 2	.50	0.4-0.8	.04	.05	0.5-2.0	19.5	6.5	—		30325	325	—
	Class 3, Type A,C,E,F	.15	1.0	.04	.04	1.0	0.6 Max.	11.5-13.5	0.6		51410	410	5613B
	Class 4	.06-.15	1.0	.04	.04	1.0	0.5 Max.	16.0	0.6	Bars and Forgings (Except for reforging)	51430	430	—
	Class 5, Type A,F	.30-.60	1.0	.04	.04	1.0	0.5 Max.	12.0-14.0	—		51420	420	5620A
	Class 6, Type A,C,E	.15	1.2	See Spec.	See Spec.	1.0	0.5 Max.	12.0-15.0	See Spec.		51416F	416	5610D
	Class 7, Type A,B	.12	0.2-2.0	See Spec.	See Spec.	1.0	8.0	17.0	See Spec.		30303F	303	5640E, 5641
	Class 8, Type A	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30321 or 30347	321 or 347	5645E 5646B
	Class 9, Type A,C	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	1.75-2.50		30316	316	5648A
	Class 10, Type A	.55-1.10	1.0	.04	.04	1.0	0.5 Max.	16.0	0.4-0.7		51440C	440C	5630A
QQ-S-766a	Class 1, Cond. A	.08	0.2-2.0	.04	.04	1.0	8.0	18.0	—		30304	304	—
Amend 1	Class 2, Cond. A	.12	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30302	302	5515B, 5516B
	Class 3, Cond. A	.15	1.00	.04	.04	1.0	0.6 Max.	16.0-18.0	—		51410	410	5504A
	Class 4, Cond. A,B,C,D,E	.09-.20	0.2-2.0	.04	.04	1.0	6.0	17.0	—	Plates, Sheets, Strip and Shapes	30302	302	5515B, 5516B, 5517C, 5518B, 5519D
	Class 5, Cond. A	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	1.75-2.5		30316	316	5524
	Class 6, Type A	.10	0.2-2.0	.04	.04	1.0	8.0	17.0	—		30321 or 30347	321 or 347	5510D 5512B
	Class 7, Type A	.12	1.0	.04	.04	1.0	0.6 Max.	14.0-18.0	—		51430	430	—
	‡	.12	0.5	.03	.03	0.75	0.6 Max.	16.0-18.0	—		51430	430	—

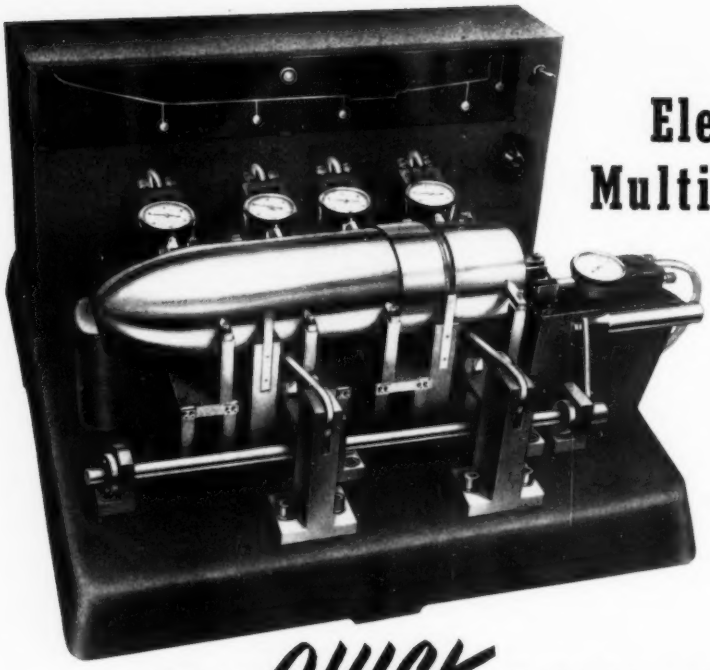
MINOR CONSTITUENTS FOR STEELS ON PAGES 163 TO 167

Specification	Minor Constituent
MIL—S—853 (Ships) Class 8, Type A	Ti. 5 × C min. or Cb...Ta. 10 × C min.
MIL—S—854 (Ships) Class 8, Cond. A	
MIL—S—6721 Composition Ti.	Ti. 6 × C min. 0.75 max.
MIL—S—6721 Composition Cb.-Ta.	Cb...Ta. 11 × C min. —1.35 max.
MIL—T—6737	Ti. 4 × C or Cb...Ta. 8 × C min. —1.0 max.
AN—T—43: Comp. 2 AN—T—82 AN—WW—T 858 46S 18e, Class 8	Ti. 4 × C min. or Cb...Ta. 8 × C min.

Specification	Minor Constituent
46S 26a, Class 8 47S 20, Class 6, Cond. A 57—180—3c. QQ—S—763a, Class 8, Type A QQ—S—766a, Class 6, Type A	Ti. 4 × C min. or Cb...Ta. 8 × C min.
AN—S—757: Comp. Ti.	Ti. 6 × C min.
AN—S—757: Comp. Cb.	Cb...Ta. 10 × C min.
47S30, Class 4	Cb...Ta. 8 × C min.
AN—S—771 Comp. FMS Comp. FMP	P + S, min. 0.18
AN—S—771 Comp. FM Se	Se 0.15-0.25

Maximums and minimums for chief elements are in accordance with footnote on page 163

‡ Alternate for Class 7, if for Quartermaster Corps, Army Service Forces.



Electricator Multi-Dimension Gage

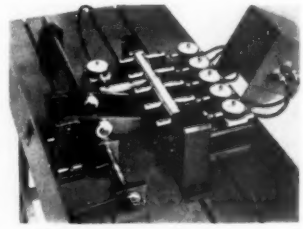
....ONE *QUICK* LOOK TELLS ALL!

Whether it's shells or shafts, fuses or jet engine blades—whether it's two, or twelve, or more dimensions you can tell at a single glance if all are within tolerance or not; for diameter or concentricity, and for length or any other dimension. You can also find out quickly *how much* any dimension is "off" so you can save and classify oversize pieces for reworking.

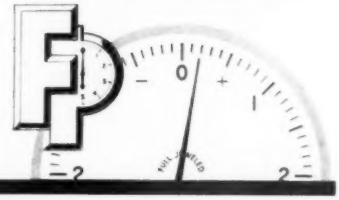
This is possible because the Federal-Electricator units which gage each dimension combine the advantage of the Dial Indicator graduations with electrical tolerance contacts. If any dimension is wrong its identity is immediately flashed on the light panel. The Dial Indicator graduations also make it easy to set the Gage to size limits. A pilot light tells you at all times that the Gage is in working condition.

Anything from small pieces to large can be gaged. Some Electricator Multi-Dimension Gages are made adjustable for various sizes (see photo below). Large pieces are lifted in or out by either hand or foot-operated lifting arms as shown in illustrations.

Tell us about your requirements, and let us figure out the Gage that will tell you what you want to know quickly and positively. FEDERAL PRODUCTS CORP., 1210 Eddy St., Providence 1, Rhode Island.



This Electricator Gage is adjustable for workpieces of various diameters and lengths. Notice a single monitor light signals when any dimension is "off".



FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES

TALKING SHOP

Definition

BACK IN 50 B.C. Vitrivius, architect for Caesar, gave this concept of an architect (engineer): "An architect should be a great writer, a skillful draftsman, versed in geometry and optics, expert in figures, acquainted with history, informed on the principles of natural and moral philosophy, somewhat of a musician, not ignorant of the sciences both of law and physics, nor of the motions, laws and relations to each other, of the heavenly bodies." Try that on for size!

Time Saver

TO CUT TIME in replying to letters, Porter-Cable Machine Co., Syracuse, N. Y., has developed a note-size sheet, 8 in. wide by 3¼ in. deep, that can be clipped to the top of the letter. A printed box, signed by Pres. D. J. Ridings, explains that the note will save you time in two ways—avoiding stenographic delay, and making it unnecessary to refer to your original file copy. On the note, the Porter-Cable man can hand-write his answer.

Non-Rust Escape

ELGIN WATCH CO. completed on Sept. 7 the manufacture of 50 million watches, observed the event by announcing a non-corrosive alloy escape wheel for jeweled watches. It is better because it can be given a mirror finish. Mainspring, balance wheel and hairspring are already non-rust alloy. Thus the watch will soon be non-rust construction. But the escape wheel, about ⅛ in. dia, with 15 teeth each 0.015 in. long, must take a tremendous beating (transmits energy 5 times per sec), because the "tick" you hear is the pallet jewel striking a tooth. Thus escape wheels have always been hardened steel.

Daffynitions

OBEDIENCE: what parents expect—in other people's children . . . TIMBER WOLF: lumberjack on Saturday night . . . FAMILY TREE: way of tracing yourself back to better folks than you are . . . DICTATOR: give him an inch and he thinks he's a ruler . . . RUMMAGE SALE: device for moving things from attic to attic . . . MOVIE QUEEN: star of rage and scream . . . KIDNAPER: youngster on siesta . . . ALIMONY: high cost of leaving . . . WOODSHED: old-fashioned heir conditioner . . . BATHROOM SCALE: lie detector . . . HONNEYMOON: man's vacation before working for a new boss . . . PRETTY GIRL: m-m-m-model.

Career Before Community

FRED T. AGATHY, process engineer at Allis-Chalmers, speaking to a group of young engineers at the ASME Fall Meeting in Minneapolis, told his audience not to participate in community affairs until they had established themselves. Mr. Agathy's point was that if the young engineer makes proper use of his leisure, he will have no time to spend on outside activities, at least for the first few years.

One-Hoss Shay Tooling

DURING WORLD WAR II, one plant had a tremendous automatic-lathe department producing machine-gun bullet cores. Experience with millions of pieces established three basic principles for maximum tool life. First, tooling was supplied in sets, so when one tool failed, all were changed, the theory being that downtime could thus be held to a minimum. Second, coolant and speeds were carefully chosen and tested, then held constant. Tool angles, finish and hardness were juggled for best performance. Third, loads were balanced among positions and tools so all ended up with comparable loadings. This could be judged by watching frequency of failure at each tool position.

Half As Much Oil

NORDBERG Manufacturing Co., Milwaukee, cut lubricating costs 74%, amount of lube oil 50%, and oilers' work 90% by installing 3 solenoid-operated automatic oilers to replace 20 hand-operated oil cups on a 100-in. boring mill. The oilers, manufactured by Oil-Rite Corp., Milwaukee, cut lubricating costs from $281 to $75 a year. They are tied in with the drive motor, so are started and stopped automatically with the motor. They are gravity-fed from one of three reservoirs.

Between Charlies

DETROIT AUTOMOTIVE CIRCLES are now distinguishing General Motors' C. E. Wilson from GE's (formerly—now Washington's) by calling the first "Gasoline Charlie," the second "Electric Charlie."

Self-Promotion

REWARDS TO EMPLOYEES for usable suggestions and for bringing new employees to the firm are a familiar incentive, and are widely recognized. But have you heard of this one? A large electronic equipment manufacturer pays a bonus of $50 to any employee who provides a lead or introduction which directly results in publicity favorable to the company. Every employee is encouraged to be company promotion-conscious, with a resulting improvement in community and industrial relations. Of course, material must be okayed for security and release by the company PR office.

News of Metalworking

McGraw-Hill WORLD NEWS

THEY'RE ALL MAKING 'JEEPS'—Two Italian automobile manufacturers are introducing 'Jeep'-like vehicles. Fiat's new torpedo-shaped "Campagnola," which seats six, features 4-wheel drive, eight forward and two reverse gears, carrying capacity of 500 kg. The 4-cyl 53-hp engine attains a maximum speed of 100 kmh. It's equipped with power take-off for agricultural purposes. Alfa Romeo's version is amphibious, and has maximum speed on land of 120 kmh. It can carry a 1300-kg load or up to ten pasvsengers. It also can be used for driving auxiliary machines such as water pumps and circular saws.

EUROPEANS EYE BRAZIL—European industrial companies continue to eye Brazil as a spot either for expansion or for transfer of operations. Recent developments: Schindler interests, of Switzerland, will build a factory at Barra do Pirai in Rio mountains for manufacture of elevators, railway cars and diesel motors. Isothermos, of Milan, Italy, is building a plant at Jundiai, Sao Paulo state, in conjunction with Brazilian investors, to manufacture motorcycles and light delivery trucks. Metropolitan-Vickers, Great Britain, has been surveying prospects at Belo Horizonte, Minas Gerais state, for a plant to build heavy industrial equipment. Several French combines have been discussing establishment of factories near Belo Horizonte. Projects include manufacture of electric motors, diesel motors, metalware and a textile plant. The Sao Paulo area is slated for a branch plant of the Krupps industries.

FINSIDER REORGANIZES—The Italian corporation, Finsider, is being reorganized. The Dalmine plant is to produce tubes; the Ilva plant section irons and bolts, and Terni will make magnetic plate. The plants will work in cooperation with a large continuous-production steel mill to be erected at Cornigliano. Armco Steel Corp. is supplying equipment and know-how for the ECA-financed undertaking.

Increasing Defense Output

WASHINGTON—The mounting production of military weapons and equipment called for by Defense Mobilizer Charles E. Wilson in his third quarterly report is bound to mean more cuts in consumer goods.

Just how far the cuts will go—and when—depends on decisions yet to be made. Mr. Wilson, himself, refuses to predict any slashes at all. But even his optimism doesn't go beyond first quarter of next year.

Already first-quarter materials allotments have been fixed at "slightly less" than October-December levels for consumer durables. That means something under 58% of their pre-Korea supply of steel.

• **But take Mr. Wilson's forecasts** for military production in his report this week. His charts show deliveries of hard goods for the armed services more than doubling in the year after October 1, 1951.

That means the military's take of raw materials, especially metals, also will soar. True, the materials demand isn't likely to double, but it's almost certain to outstrip anticipated increases in total metal supplies. And the only way to make up the deficit is to take it from civilian lines.

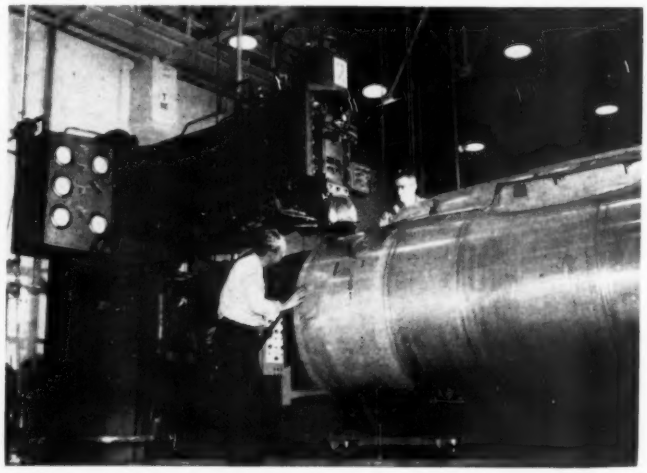
Some of Mr. Wilson's aides—the men who have to make the hard decisions on how much metal goes to tanks, how much to refrigerators—already are grappling with the problem. They're betting consumer goods will have to be cut back again in the second quarter. How much depends on three factors:

(1) Military demands for metals. There are now definite estimates of military needs only for the first quarter. It is obvious subsequent demands will be greater but officials want firmer figures before calling for cuts in other production.

(2) How much metal the expansion programs will produce. New steel, aluminum and other production are coming in this year and next. They won't make up the deficit in military needs, but they'll help—if they produce on schedule.

(3) What further cuts consumer goods makers can stand. No one wants to shut down plants. And the controllers don't know what is the minimum of materials necessary to keep most industries going and profitable.

The rate of deliveries of military hard goods is only an indicator of



Resistance welding machine, recently installed in the plant of Ryan Aeronautical Co. at San Diego, Calif., can handle this external fuel-tank section, the largest known to be in production. Built by Federal of Warren, Ohio, to Ryan specifications, the huge welder has a 60-in. throat and will take up to two sheets of ⅛-in. aluminum alloy

to Mean More Civilian Cuts

metals use. Military production already is chewing up metal at a rate well above deliveries of finished items. That's because of the six-to-nine months lag in fabricating and finishing. So the 100% plus jump in arms deliveries won't mean a corresponding rise in materials consumption. About 25% will be more like it.

But note that this doesn't cover any increase in military and allied programs. For example, a 130-140 wing Air Force, which the Pentagon has agreed is needed. Mr. Wilson's program is based on 95 wings.

• **Increased aid to our allies,** either military or economic, as well, would force Wilson to raise his military production goals before next fall.

Industrial expansion — notably steel and aluminum—is nearing the peak of their materials demands. These plants will have their structural steel in place, the copper and aluminum for their equipment, some time before they are actually in operation. This will release metal for other demands, a lot by next fall.

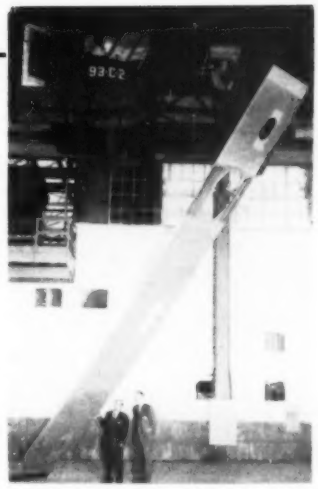
But other portions of the expansion program are lagging. Part of the lag is due to shortages of metal.

The hope is to phase out the retarded projects to keep work going on those most urgently needed, start the others later. On steel, for example, Mr. Wilson ordered full speed ahead on ingot production, a delay on fabricating facilities until the furnaces are ready.

But this only delays part of the expansion take of metals. ODM aides have only started adding up the total materials needs of all industrial expansion. The delayed plants may need more metal faster than it can be diverted from completed facilities.

• **As to consumer goods,** there's been a switch in Washington thinking on keeping makers in business at some level. There is serious talk of reviving the so-called "death sentence" orders on aluminum and copper use.

But, from Mr. Wilson down, the controllers want to keep major producers—autos, appliances, furniture—going to avoid large-scale unemployment. The military program, as Mr. Wilson points out, still doesn't need either the plants or the manpower of these industries—yet.



One-piece, 32-ft long section for Lockheed's Super Constellation is largest single piece of wing ever fabricated. Cut from solid slab of metal, it replaces some 1500 parts and 5000 rivets; strengthening without adding weight. It is being inspected by S. N. Bean (left), chief tool engineer, and H. W. Benjamin, production engineer

OCTOBER MEETINGS

Oct. 15-19—National Metal Congress & Exposition; Hotel Statler and Michigan State Fairgrounds, Detroit.

Oct. 15-18—Society for Non-Destructive Testing, Inc., annual meeting; Hotel Detroiter, Detroit.

Oct. 22-24—American Standards Assn., annual meeting and National Standardization Conference; Waldorf-Astoria Hotel, New York.

Oct. 22-26—American Institute of Electrical Engineers, fall meeting; Hotel Cleveland, Cleveland.

Oct. 25-26—Gray Iron Founders Society, Inc., fall meeting; Edgewater Beach Hotel, Chicago.

Oct. 28-30—Conveyor Equipment Manufacturers Assn., fall meeting; The Homestead, Hot Springs, Va.

Oct. 29-31—American Gear Manufacturers Assn., semi-annual meeting; Edgewater Beach Hotel, Chicago.

Oct. 31-Nov. 1-2—Industrial Management Society, Time & Motion Study Clinic; Sheraton Hotel, Chicago.

Metalworking Firms Purchased

• **McCulloch Motors Corp.,** Los Angeles, has purchased Rhodes Lewis Co., Culver City, Calif., engineering firm and manufacturer of aircraft components. Existing contracts between Rhodes Lewis and the government and airframe manufacturers that total more than $6 million will remain in effect.

• **Shawnee Mfg. Co.,** Madeira, Ohio, has purchased C. & P. Mfg. Co., Dayton. Included in the assets are patents and manufacturing rights for Pixle stock pushers and pads for automatic screw machines.

• **Stronghold Pacific Corp.,** western affiliate of Stronghold Screw Products Inc., Chicago, has purchased Rivco Inc., Downey, Calif., manufacturer of fasteners.

• **Bowser, Inc., Chicago,** has purchased National Scientific Laboratories, Inc., Washington, D. C.

• **Carpenter Steel Co.,** Reading, Pa., has purchased Webb Wire Works, New Brunswick, N. J., to be operated as the Webb Wire Div. Everett F. Waltman was named manager.

• **H. K. Porter Co., Inc.,** Pittsburgh, has acquired Buffalo Steel Co., Tonawanda, N. Y., producers of light steel products.

• **Cleveland Pneumatic Tool Co.** has purchased the Clayborne engine stand equipment line from Clayborne Mfg. Co., Chicago.

• **Aro Equipment Corp.,** Bryan, Ohio, has purchased Pyles Industries, Inc., Detroit, to be operated as a subsidiary. Pyles manufactures heavy duty pumps, metering devices, and lubricant-handling equipment. George S. Pyles continues as president.

• **Koppers Co., Inc.,** Pittsburgh, has purchased an interest in Continuous Metalcast Co., Inc. Engineering, fabrication, erection and sale of continuous casting machines licensed by Continuous Metalcast will now be performed by Koppers' Freyn Engineering Dept. Licensing to use the processes will continue through Continuous Metalcast. Interests in the latter firm are also held by Allegheny Ludlum, Scovill Mfg. Co., and American Metals Co., Ltd.

New Companies Organized

• **Rite-Way Tool Co.,** Pittsburgh, has been organized by Oliver B. Schmeltz and Thomas M. Rees, of Rees Machinery Co., to market standard and special metal cutting tools and machine tool accessories. Headquarters: 1612 Potomac Ave. Rees Machinery Co. will continue to function as heretofore.

• **South Bend Metal Products Co.,** South Bend, Ind., has been organized by C. A. Bloom and H. F. Hall to make special steel stamps, nameplates and small flat drills, and to do contract engraving. The shop, at 831 Wilber St., also is equipped for precision dial graduating and for contract work on engine lathes and turret lathes.

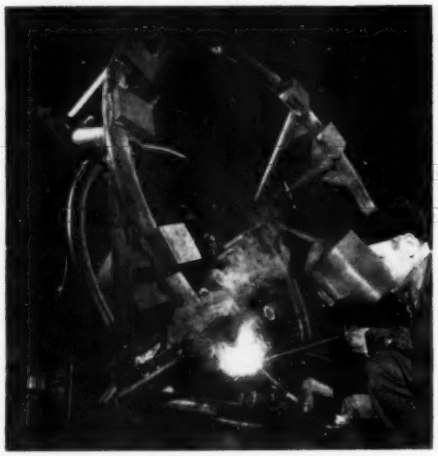
• **Wheelco Instruments of Canada, Ltd.** has been organized as a subsidiary to handle Canadian operations of Wheelco Instruments Co., Chicago. The new company, under direction of Francis Beaupre, has offices at 601 Merton St., Toronto.

• **Elgin National Watch Co.,** Elgin, Ill., has organized an Abrasive Div., to be headed by C. R. Myer, manager. John F. Ireland will direct sales and D. H. Prentice will act as technical director. Elgin markets a line of diamond abrasive materials under the trade name DYMO.

ASME Holds Fall Meeting

MINNEAPOLIS—In a program of 23 sessions, 49 technical papers were delivered at the fall meeting of American Society of Mechanical Engineers held here Sept. 26-28 at the Hotel Radisson.

Recent developments and new trends in mechanical engineering were highlighted in the technical program. Arthur D. Somes, division engineer, Turbine & Gear Div., General Electric Co., Lynn, Mass., described advances of recent origin in industrial turbines. Stanley F. Steiner, manager of industrial engineering at the automatic transmission plant of Ford Motor Co., Highland Park, Mich., talked on the tooling of automatic transmission.



Reconditioning of World War II aircraft-engine mount at Ford's River Rouge plant. The mounts will be used in the production of P&W engines Ford is making in Chicago

110 Companies Represented at Pressed Metals Institute

CHICAGO—Thomas L. Baker, vice president, National Stamping Co., Cleveland, was elected president of The Pressed Metal Institute at its annual meeting here October 3, 4, and 5. He succeeds Howard C. Wolf of Mullins Mfg. Corp., Salem, Ohio. Owen H. Wenning, sales manager, Worcester Pressed Metal Co., Worcester, Mass., was elected vice president of the institute, and Hunter Morrison, Jr., vice president, Morrison Products, Inc., Cleveland, was re-elected secretary-treasurer.

Outstanding action taken at this meeting was adoption by board of directors of a safety program tailor-made for the stamping industry by the PMI Safety committee headed by Walter T. Baird of Toledo Pressed Steel Co., Toledo, Ohio. The committee studied all types of safety programs, including those used successfully for many years by the Drop Forgings Association, and by General Electric Co., Schenectady.

The report of the safety committee was presented to the members present at the meeting by Mr. Baird and by E. H. Meeks, personnel director, Transue & Williams Steel Forging Corp. New developments in safety equipment were shown in an exhibit adjacent to the meeting room by seventeen manufacturers.

Bennett S. Chapple, Jr., assistant executive vice president, United States Steel Co., speaking at the PMI annual banquet Thursday night, told his audience that "continued expansion of America's industrial capacity is essential to our survival and long-range prosperity." He warned that three distinct hazards threaten the nation's future progress, prosperity and happiness, and listed these as: the danger of a third world war, inflation, and "the thread of creeping socialism."

Attacking the principle of government controls, Mr. Chapple said that given the opportunity, the steel industry is better qualified to do the job faster, cheaper, more efficiently, and with considerably less confusion. "Government control is wasteful, arbitrary and often subject to political pressure," he asserted.

Mr. Chapple said that centrally administered controls will not and cannot work efficiently in a capitalist economy, no matter how wise, talented and honest the administrators may be.

American impressions of the British stamping industry were discussed at Friday's meeting by PMI members of an ECA team who recently toured The British Isles, and by J. P. Molony of the international executive board District 4, United Steel Workers of America, also a member of the ECA team.

More than 200 representatives from 110 companies registered for the discussion sessions, and more than four hundred members and guests were present at the banquet.

Wanted: 75,000 Machine Tools, Air Force Tells Distributors

ATLANTIC CITY, N. J.—Some 75,000 machine tools will be required to tool up for the air force's present production program. Lt.-Gen. Orval R. Cook, Deputy Chief of Staff Materiel, U. S. Air Force told members of the American Machine Tool Distributors Association at their meeting here at Haddon Hall on October 1-2.

In addition 10,000 machine tools for maintenance shops of the Air Force must be acquired. About 40,000 of the machines in the total program are yet to be ordered.

Only 5,650 out of an original 35,000 machine tools still are in the Air Force reserves, Gen. Cook asserted, and about 500 of the remaining machines are to be declared surplus soon. The Air Force is inviting suggestions of what to do with the 5,150 which will then be in storage.

Gen. Cook endorsed the desirability of some sort of urgency rating for Air Force production programs. But he made clear the necessity for keeping programs in balance with each other.

In developing new techniques for building aircraft, especially heavy extended parts, the Air Force has in mind these two factors: (1) conservation of machining time and (2) conservation of materials.

• **The armed services** should return to the urgency rating system for machine tools used in 1941-1945, Edgar J. Seifreat, Seifreat-Elstad Machinery Co., Dayton, Ohio, said in reporting as chairman of the association's government relations committee. The aim should be to give priority to one program over another and get a specific plant tooled up and going. To produce machines with all programs rated alike is to insure serious delays.

Mr. Seifreat, who is president elect of the Association, suggested that Exhibit B of NPA's machine tool distribution order M-41 is not realistic so far as Air Force needs are concerned. He commented that pool orders are not as successful this time as in World War II.

• **Though machine tool builders** have been allotted greatly increased quantities of steel under CMP the fact is that they buy largely from warehouses which have been able to get from the mills only 40% of tonnage previously taken, Tell Berna, general manager NMTBA, reported. Result is that builders are very short of steel, especially ground steel shafting and plates.

Mr. Berna stressed the need to maintain today good service to customers and to continue high standards in building machine tools. He expressed hope of expanding sharply subcontracting facilities as pinch on materials and manpower tightens. Washington is genuinely interested in helping the machine tool industry increase production, Mr. Berna indicated. He predicted that only a limited number of foreign-made machine tools would be applicable to the defense program because most of them are of the general purpose types. He is pessimistic about the possibility of selling any U. S. general purpose tools abroad after the defense program. Competition from European builders will prevent it.

• **Buying dollar savings** is the chief interest of machine tool users in purchasing new machine tools, A. R. Eckberg, director of engineering and maintenance, Kodak Park Works, Eastman Kodak Co., Rochester, N. Y., asserted. These savings arise from (1) greater productivity, (2) more automatic controls and (3) greater built-in precision.

Machine tool salesmen should study their customer's problems in great detail, Mr. Eckberg said. They should keep up with technical developments by reading technical journals. They should not hesitate to recommend machines not made by their own company.

German machine tools shown at the recent Paris show were much heavier and more powerful than equivalent French and Italian machines, Manus F. Campbell, Peninsular Machinery Co., Detroit, declared. He said that European builders have gone overboard on electronic controls. The British are quoting 18 to 24 months deliveries, not much different from the situation here. Mr. Campbell reported that British authorities are skeptical about the delivery promises made to them by German machine tool builders.

Whether business continues good after the defense program depends upon the outlay for new plant and equipment, Dexter M. Keezer, director of economics, McGraw-Hill Publishing Co., Inc., New York, predicted at the dinner session. He pointed out that substantial part of funds so invested since the war have come from net profits of industry. The present excess profits law may well destroy in part this source of capital investment and thereby reduce the money availlable.

EDGAR J. SEIFREAT, elected president of American Machine Tool Distributors Association

E. B. MacDONALD, outgoing president of AMTDA, presided at 27th annual meeting

• **Members elected to office** with Mr. Seifreat as president were: John M. Riordan, Riordan Machinery Co., Detroit, first vice president; E. R. Motch, Jr., Motch & Merryweather Machinery Co., Cleveland, second vice president; G. B. McClennen, Delta Equipment Co., Philadelphia, secretary-treasurer; directors for three year terms, M. F. Campbell, Peninsular Machinery Co., Detroit; J. D. Germain, Eccles-Germain Machinery Co. J. F. Owens, Jr., J. F. Owens Machinery Co., Syracuse, N. Y. was elected to one year term as director.

John F. Spaulding

J. W. Gooch

L. K. Stringham

Ed C. Quinn

Names in the News

John F. Spaulding has been appointed sales manager, Black & Decker Mfg. Co., Towson, Md. Mr. Spaulding has been with the firm since 1926 and was previously manager of the Buffalo, N. Y. branch of the firm.

Frederick B. Powers has been named president, Rawlplug Co., Inc., New York. He has been with the firm since 1934.

William Croysdale has been named manager, of the Bartlett Hayward plant, Metal Products Div., Koppers Co., Inc., Baltimore, Md. He was formerly assistant to the manager of the production department.

W. Cordes Snyder, Jr. has been elected president and chief executive officer, Blaw-Knox Co., Pittsburgh. Mr. Snyder was formerly a vice president of the company in charge of its Lewis Foundry & Machine Div. and more recently has been vice president of the Koppers Co. and manager of its metallurgical department.

J. W. Gooch has been appointed assistant plant manager in charge of manufacturing operations, DoAll Co., Des Plaines, Ill. He will head the company's expansion program to produce a complete new line of cutting tools, gage blocks, and industrial supplies.

L. K. Stringham has been appointed chief engineer, Lincoln Electric Co., Cleveland, Ohio. He has been with Lincoln since 1933 and was formerly director of the welding department.

John W. Belanger and **Nicholas M. DuChemin** have been elected vice presidents, General Electric Co., New York. Mr. Belanger was also appointed general manager of the Defense Products Division. Mr. DuChemin was recently placed in charge of the company's Manufacturing Services Division. Mr. Belanger was formerly general manager of GE's Large Apparatus Division, Mr. DuChemin had been general manager, Small Apparatus Div.

Ed C. Quinn has been named vice president and general manager, Chrysler Div., Chrysler Corp., Detroit. Mr. Quinn has been in the automotive industry since 1913 and directly associated with the Chrysler organization since 1934. Prior to his present appointment he was general sale manager of the Dodge Division.

Charles Lawson has been named master mechanic of Pratt & Whitney Aircraft, East Hartford, Conn. Before joining P&WA 23 years ago, Mr. Lawson had spent many years in a supervisory capacity with Heald Machine Co., Worcester, Mass.

Arthur J. Wieland has been elected a vice president, Ford Motor Co., Dearborn, Mich. Mr. Wieland is general manager of the company's International Division.

Don Balfour has been appointed factory manager, Texas Engineering & Mfg. Co., Inc., Dallas, Texas. He was works manager of the Nashville Div., Consolidated-Vultee Aircraft Corp. during World War II, and more recently plant superintendent for Avco Mfg. Co. at Nashville.

W. Cordes Snyder, Jr.

John W. Belanger

Nicholas M. DuChemin

Don Balfour

John C. Ewer

John C. Sears

H. Kingsley Pohlman

Robert C. Becherer

John C. Ewer has been appointed managing director, Norton Grinding Wheel Co., Ltd., Welwyn Garden City, Herts, England. Mr. Ewer has served as assistant general manager of the English plant since 1950 and has been with Norton since 1934.

Carl J. Gross has been appointed general manager of the newly created midwestern dept., Federated Metals Div., American Smelting & Refining Co., New York.

Myron H. Eichengreen has been appointed a vice president, Block Steel Corp., Forest Park, Ill. He was formerly with Inland Steel Co.

L. W. Hanson has been appointed vice president of Armco Drainage & Metal Products, Inc., and manager of the Calco Div., Armco Steel Corp., in Berkeley, Calif. He succeeds **C. R. Hodgkin** who has been named to a consulting capacity.

Charles T. McKinnie has been appointed assistant sales manager, Pratt & Whitney Aircraft Co., United Aircraft Corp., E. Hartford, Conn. He has been chief of western field engineering for the company's service corporation.

Frederick O. Muller has been named director of procurement, Republic Aviation Corp., Farmingdale, N. Y.

Leon R. Steffen has been named director of purchases, AC Spark Plug Div., General Motors Corp., Toledo, Ohio. He succeeds **Herbert R. Wells,** who is retiring after 40 years of service to the company.

Frank H. Webster has been appointed assistant manager, Western Div., Hyatt Bearing Div., General Motors Corp., with offices in Chicago.

John C. Sears has been appointed executive secretary, American Gear Manufacturers Association, Pittsburgh. He succeeds **Newbold C. Goin**, who has joined the management consulting firm of Brenholts, Goin & Ogg.

H. Kingsley Pohlman has been named vice president in charge of manufacturing, National Motor Bearing Co., Redwood City, Calif. **Park Q. Wray** was named vice president in charge of sales, and **Milton C. Bulkeley**, vice president and treasurer.

William E. Mulcahy has been named supt. of foundries, Hunt-Spiller Mfg. Corp., Boston, succeeding **Harry Oldham,** named consultant for the foundries. **Frederick L. Murray** was named assistant supt. of foundries.

Robert C. Becherer has been elected executive vice president, Link-Belt Co., Chicago. He was formerly general manager of the Ewart plant, Indianapolis, and in that position will be succeeded by **Richard E. Whinrey.**

Oliver Smalley, president of Meehanite Metal Corp., New Rochelle, N. Y., has been elected an honorary life member of the Institute of British Foundrymen, London.

G. F. Vietor, Jr., has been named Houston (Tex.) district manager of Air Reduction Magnolia Co., a division of Air Reduction Co., Inc., New York.

John B. Madden has been named hydraulic sales manager for the north Central district of A. O. Smith Corp., Milwaukee.

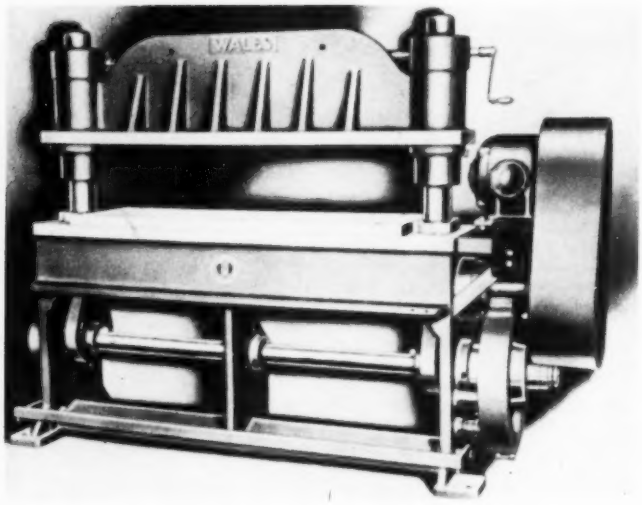
OBITUARIES

C. L. Best

C. L. Best, 71, chairman of the board and member of the executive committee, Caterpillar Tractor Co., Peoria, Ill., died Sept. 22. Mr. Best was a pioneer inventor and tractor builder and one of the founders of Caterpillar. He formed the C. L. Best Tractor Co. at Elmhurst, Calif., in 1910 and continued as president of the firm until 1925 when it and the Holt Mfg. Co. were merged to form Caterpillar Tractor Co. Best became chairman of the board of the new company.

Joseph E. Rogers, 71, retired president of the Addressograph-Multigraph Corp., Cleveland, died Aug. 27. Mr. Rogers still was a member of the board of directors of the company and a member of its executive committee. He was a vice president of International Business Machine Corp., which he left in 1926 to accept the presidency of the Addressograph International Corp. in Chicago.

New Shop Equipment



Wales Twin-Column Punch Presses Eliminate Die Sets

Because of the similarity of design between these punch presses and a standard die set, the necessity of die sets can, in many cases, be eliminated. The presses may be used for all types of blanking, forming, drawing, and bending. Wales hole-punching and notching equipment and a self-contained shearing attachment are available as optional equipment.

The cylindrical pair of ram guides are 4 in. in diameter, precision ground, and highly polished. They are positioned vertically at exactly 90°. The actuating mechanism of the ram operates inside the vertical ram posts.

The guide sleeves are hand scraped, individually fitted, and held to the tolerance of 0.00025 in. Heavy-duty liners in the sleeves are enclosed by a two-way seal that eliminates dirt and chips by wiping the ram posts clean. The other side of the two-way seal retains a half pint of oil for lubrication.

The 4-point clutch has a sliding dog that engages the bull gear in any one of the four positions located in the gear. The dog slips into the driving pin recess located at each quarter of the gear. All gears are herringbone for quiet, smooth operation.

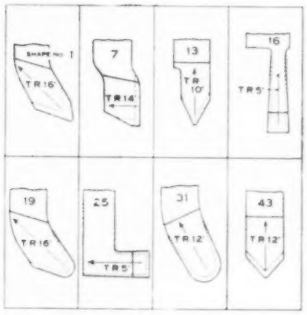
The bottom face of the ram is machined smooth for accurate mounting of dies. The clearance holes are located across the bottom face for mounting large or multiple shankless dies.

The ram has 2-in. adjustment. It is made by loosening the lock collars at each end of the ram, turning the crank to lower or raise the ram to the required position and tightening the collars. A long adjusting bar that is parallel with ram and is turned by the crank, assures accurate adjustment at both ends of the ram.

A dual-purpose clutch counterbalance supplements the conventional friction brake which is installed on the end of the shaft. A heart-shaped cam is installed on the crankshaft and secured to the face of the brake drum. A roller, held with a one-ton pre-loaded spring pressure rides on the surface. During down stroke of ram the rotation of the cam raises the roller and compresses the spring, thereby counterbalancing the ram weight. During up stroke of ram the roller pressure on the surface of the cam rotates the crankshaft approximately 5° ahead of the bull gear. At point of clutch disengagement, this pre-rotation eliminates all drag and pressure on the length of the clutch dog, and enables clutch engagement and disengagement with ease.

Knock-out attachment, punch-shank adapter, pneumatic-draw die cushions, friction-clutch arrangement, variable-speed arrangement, and self-contained shearing-die attachment are available as optional equipment.

Wales-Strippit Corp., North Tonawanda, N. Y.



Solid HSS Heads Welded to Shanks on Milne Tools

Line of Superweld tools feature solid heads of equal section to the tool shanks. The heads and shanks are joined by electric butt welding.

The heat-treated heads are made of Stag Major HSS, containing 21.00% tungsten, and 13.00% cobalt. The shanks are of medium carbon steel.

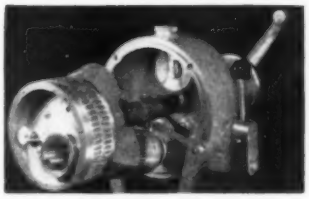
The solid head, of course, provides more usable cutting steel than a tipped tool. And it is possible, when necessary, to grind a new shape into the tool. Also, they are reported to have the same ability as solid tools to withstand heavy cutting loads.

The tools are available in 31 standard shapes. Section sizes range from ½ in. square to 2x1½ in. with lengths from 4 to 16 in. They are also available custom made to the user's specifications.

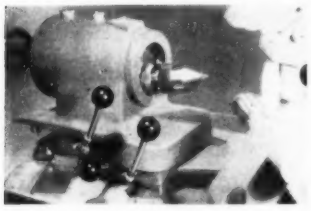
A. Milne & Co., 745 Washington St., New York 14, N. Y.

Materials and Parts

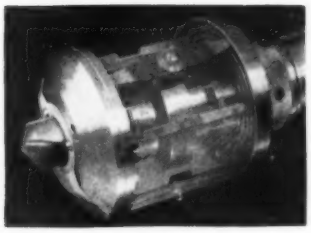
Grinding machine (German made) is said to be very accurate, simple to operate



Planetary gear system combines a rotary movement of the drill around its own axis and a circular movement of the drill and its spindle around a central axis. Result is that with each feed stroke both lips of the drill come into grinding position one after the other—creating identical relief and lip shape for both. This movement is claimed to be more accurate than cam action



The point and relief angles and the amount of lip land is adjusted by simple movement of the corresponding levers according to scales on the machine



A simple circular hand movement of the outer sheel of this socket chuck tightens or loosens the drill. There is no changing of sleeves or similar elements when shifting to different drill sizes

Planetary Gear System on Grinder Assures Accurate Drill Angles

The CAWI grinder is claimed to insure absolutely correct angles and identical shape of both lips of a twist drill or of the three lips of an end mill.

The drill is held on its circular lands by a socket chuck in two sizes —for 0- to ½-in. and ½- to 1-in. drills. Levers control the angle sizes and the amount of lip land (carbide drills) by changing the relation of the different planetary movements to each other.

The drill need never be taken out of its socket to grind a secondary relief or to grind a larger point angle than the sides. The point angle is read directly off the machine. The relief adjusting lever in its zero position gives a 7° relief. For more or less angle the lever is moved into the positive or negative direction. When grinding carbide twist drills, the secondary relief is ground first. Then by moving the relief lever (while grinding) a primary relief is added.

The machine is provided, upon request, with grinding and lapping wheels which operate simultaneously. The coolant flows through the grinding-wheel spindle and does not obstruct the view of the operator.

The simplicity of operation of the machine allows inexperienced workers to achieve good production.

Kurt Orban Co., Inc., 21 West St., New York 6, N. Y.

...INCLUDING

Copying lathe runs at high speed (with little vibration) to fully utilize the properties of carbide tools page 178

Shaper combines a straight stroke with a swivel stroke to finish off punches page 179

Horizontal drilling machine is heavily ribbed and constructed for high speeds page 179

Oil-mist precipitator charges particles electrostatically as they enter, then deposits them on plates to be drained off page 180

Automatic tapping machines have exact limitation of feed depth, wide speed range page 182

Helical router bit is carbide tipped and has a compound helical and radial angle page 184

Power-feed router is electronically controlled—it can also be used for skin milling page 190

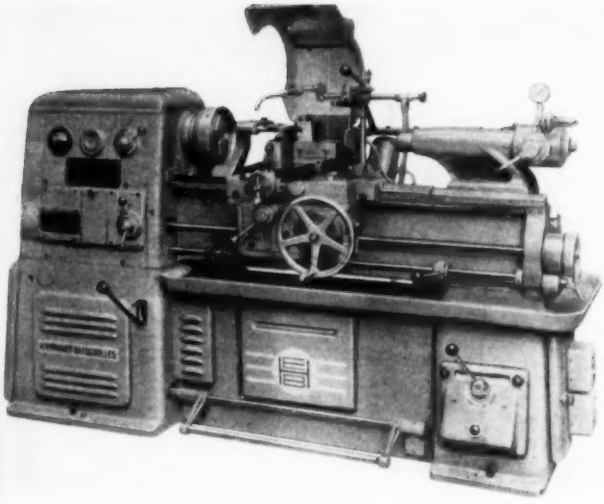
Duplicating attachment uses an electric tracer which controls hydraulic motors page 192

Induction furnace has balanced electric loading to provide uniform heating page 194

...and in Oct. 29

200-ton dieing machine is equipped with automatic double roll feed and pneumatic counterbalance

Automatic turret lathe has a 75-hp multi V-belt drive, and a magnetic clutch and brake



French Copying Lathe Fully Utilizes Carbide Tools

	OP320	OP420
Swing over bed, (in.)	13.5	17.5
Swing over saddle (in.)	5 11/16	9 11/16
Between centers (in.)	16, 28, 40	28, 40
For both models:		
No. of spindle speeds		20
Spindle-speed range		50-3600 rpm
No. of feeds		22
Sliding feed		0.0008-0.0354 ipr
Surfacing feed		0.0004-0.0177 ipr

To take full advantage of carbides these lathes have a high maximum spindle speed. But for greatest efficiency, there must be a complete absence of vibration at these high speeds. To achieve this, vibration has been eliminated at every stage of the design.

The bed, a heavy cross-braced section, together with a massive one-piece bed, form a foundation so rigid that it need not even be bolted down. The gearbox and motor are rubber mounted.

The vertically positioned cutting tool not only removes a source of vibration, but also results in longer tool life and easier setting—dispensing with the need for packing or shims.

In designing the lathe, it was felt that an all-geared spindle drive would not be satisfactory due to the small shocks as the gears meshed, particularly under the variable loading that occurs on a lathe. For this reason the motor and gearbox are mounted in the base and the final drive to the spindle is by seven V-belts from the output shaft of the gearbox to a pulley directly coupled to the spindle. Speeds below 500 rpm are obtained by interposing back gearing between the pulley and the spindle.

The copying device is designed as an integral part of the machine. The number of members between the hydraulic tracer and the cutter have been kept to a minimum and all oil ways are short and rigid. The tool-post slides at right angles to the bed. Right-angles shoulders are copied automatically by means of an electrically operated clutch on the feed shaft. It causes the carriage to remain stationary while the tool surfaces. Copying is from a turned master or flat templet. The hydraulic system is an integral part of the machine—there are no flexible oil pipes to get damaged or to cause obstructions.

Speeds and feeds are quickly changed by means of pickoff gears —with instantaneous feed reversal.

Accuracy claimed—copies to within 0.0004 in. on dia; rear tool maintains 0.0002 in. on dia; axial lengths copied to within a limit of 0.0015 in.

H. E. B. Machine Tools, Inc., 341 Madison Ave., New York 17, N. Y.

Fillerweld Developed by GE Speeds Alloy-Metal Welding

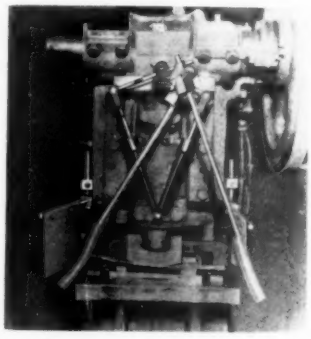
Used with gas-shielded arc welders, Fillerweld allows the operator to control the continuous flow of filler-metal automatically by means of a finger switch mounted on the torch. The welding attachment allows the operator to start or stop the flow of filler metal without breaking the arc, resulting in a smoother, faster weld. Wide application is expected in the fabrication of light structural shapes.

Fillerweld consists of two main elements, the torch and a mechanical power unit. The torch or gun is basically a manual water-cooled inert-arc tungsten holder to which has been added a control switch, and a gear assembly for pulling the filler-metal from the spool to the arc through the gun.

Rated at 250 amps, the gun accommodates tungsten from 0.040 to 5/32-in. dia and up to 7 in. long. The unit is mounted on a portable platform and can be moved from job to job.

The process can be applied to best advantage on stock less than 3/16 in. thick but when speed is not important, Fillerweld will produce a high-quality weld on thicker material. Either argon or helium can be used with the equipment.

Welding Department, General Electric Co., Schenectady, N. Y.



Searjeant Sweep Guard for Short-Stroke Power Presses

When the ram on the press is in the "up" position, both guard arms are suspended in front of the center of the bolster plate, one arm in front of the other. Thus the arms do not interfere with two-handed operation, particularly important when the job requires nesting of the piece at each end.

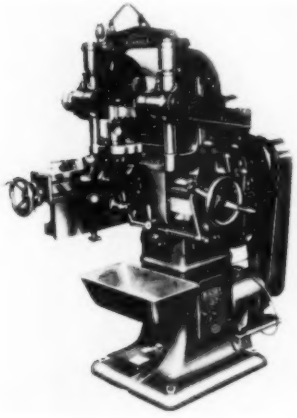
As the ram descends, the two arms swing right and left, respectively, from their central position. The entire working area is swept clear before the downward stroke has progressed far enough to close on fingers or hands. Each arm travels at only half the speed required by a single arm guard to cover the

same area. This half-speed action eliminates any tendency to snap.

The guard is mounted on a hinged bar so that it can be easily swung to one side when changing dies and making adjustments.

The guard can be equipped with a reset counter which records each downward stroke of the ram. This counter will not operate unless the guard also works, encouraging the worker to employ the guard at all times.

Searjeant Metal Products, Inc., Box 77, Mendon, N. Y.



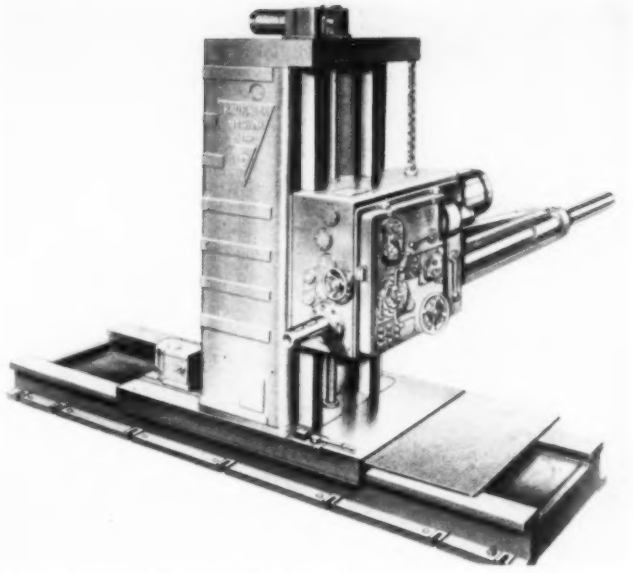
Essex Shaper Combines Straight and Swivel Strokes

This shaper is able to machine a blanking punch, hob, or profiled part direct from the solid, using simple tools and eliminating special punch holders or plates. The machine is set up very simply and a high degree of accuracy and fine surface finish are said to be obtained. In the majority of cases punches can be completely finished on the machine.

The cutting tool used is the ordinary shaping tool. The stroke is like that of an ordinary shaper set vertically and is adjustable from 1½ to 4¼ in. However, upon completion of the straight stroke, the rocker arm operates in a swivel motion, thus finishing off the desired radius.

The desired shape can be laid out or a templet mounted on the machine. The microscope attachment is set directly above the work and in this way the layout lines can be closely followed.

British Industries Corp., International Machinery Div., 164 Duane St., New York 13, N. Y.



Horizontal Drilling, Tapping Machine Has Heavy Construction

This horizontal drilling machine is reported to perform efficient drilling, reaming, boring, counterboring, tapping, and spotfacing operations at the highest feeds and speeds possible with modern cutting tools.

The box column is heavily ribbed for greater rigidity and accuracy, and the 4-in.-dia flame-hardened spindle with 42-in. spindle travel slides in a hardened steel sleeve mounted in Timken taper roller bearings. The spindle drive motor may be from 10 hp to 20 hp. It is fitted with No. 5 or No. 6 Morse taper with eighteen speed changes through sliding gears actuated by a direct-reading rotary-dial selector lever.

All controls are grouped at the front of the headstock where they are within easy reach of the operator. The pilot wheel is internally clutched, overload protected and graduated to 6 in. for depth-control drilling and tapping with automatic feed kick-out at the pre-selected depth. Headstock is completely counterweighted and has rapid traverse and electric inching through a power-driven screw with the head traverse motor located on the sheave bracket. Traverse rate is 80 ipm and overtravel is prevented by limit switches.

Runway slides are heavily ribbed semi-steel castings guided and gibbed to the runways and contain 3-hp gear motor and worm reduction to traverse column along the runway. Rate of traverse is 80 ipm with electrical inching controls for fine positioning. A screw runway slide clamp is interlocked electrically to pushbutton controls and limit switches prevent overtravel of the column.

Kaukauna Machine Corporation, Kaukana, Wis.

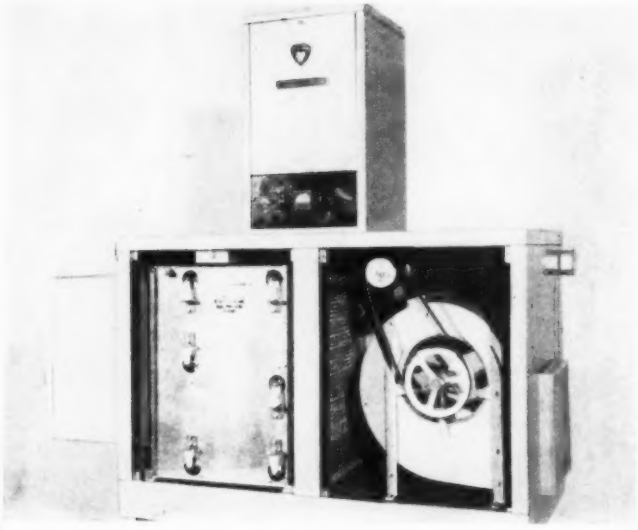
High-Speed-Steel Drill Rods Have Uniform Hardness

These hardened and ground HSS drill rods, in standard 36-in. lengths, have the equivalent toughness of conventional tool steel materials yet measure approximately 6 points higher on the Rockwell-C scale.

Blanks, cut from specially heat-treated 10-ft lengths of solid round-bar stock, are centerless ground. These blanks are available as hardened, tempered, and centerless-ground in diameters from 3/32 to 1 in. As hardened and tempered only, they are supplied in diameters from 0.118 to 0.515.

The manufacturer claims the rods to be an ideal material for punches, knock-out pins, dowel pins, rollers, plug gages, and tool bits.

Ace Drill Corp., Adrian, Mich.



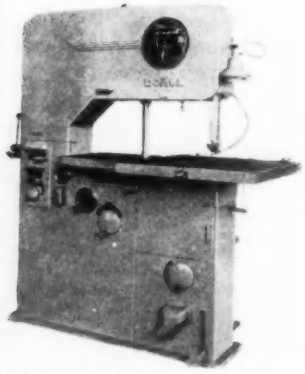
Particles Charged Electrostatically In Trion Oil-Mist Precipitator

Oil mist from machining operations is charged as it passes through an elestrostatic field and is then attracted to plates of opposite polarity. It eventually drains into a collecting pan for reuse. Under normal operations, daily recovery may be as much as five gallons.

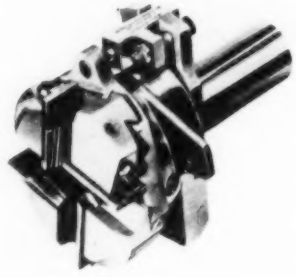
The advantages of a precipitator are: Protection of machinery and floors, walls, and ceilings from a coating of oil which creates a fire hazard and necessitates frequent cleaning; elimination of unhealthy effects of oil mist on the machine operator; and elimination of exhaust hoods.

The precipitator is constructed of heavy sheet metal and is adaptable for floor mounting or overhead ceiling suspension.

Trion Inc., McKees Rocks, Pa.



GENERAL - PURPOSE contour - sawing machine takes continuous saw, file, or abrasive bands up to ½-in. width. It has a 3-speed transmission and speed-master drive for variable-tool velocity from 25 to 6000 fpm.—*DoAll Co., Des Plaines, Ill.*

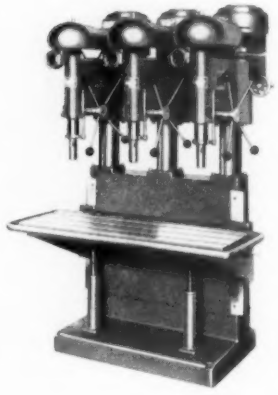


Jones & Lamson Die Heads For B&S Automatics

Jones & Lamson guarantees Class III threads for this line of die heads—covering the complete B&S range from No. 0 to 1¼ in. maximum. The die sizes are arranged so that a single given size will cover the capacity of a given Brown & Sharpe machine size.

Features include: both radial and tangent chasers mounted on face of die for free coolant flow and good chip clearance; Dualife insert chasers for No. 00 machine dies, allowing turning over and using on the other side. Two-thirds of the line have tangent chasers to provide a permanent throat. All have cushion springs for easy start, and are precision lapped. The lever handle is for use on small turret lathes.

Jones & Lamson Machine Co., Springfield, Vt.



Multiple-Spindle Drilling Machine Has Variable-Speed Drive

Features of this machine are a 25-in. swing, a variable-speed drive from which the exact spindle speed may be obtained for any size drill from ⅛ to 1 in., and an extra-large table with coolant trough.

Known as the ME-25, it is powered by a 1½-hp. axial air-gap motor. Capacity is ¾ in. in steel and 1 in. in cast iron. Distance between spindles is 14⅞ in. The table has a vertical adjustment of 12¼ in. Working surface of table is 45 x 14½ in.

The wide range of spindle speeds are obtained by a self-locking speed control convenient to the operator. There are no belts to change. Speed is read from a tachometer on the front of the machine. Five options of spindle speeds, each with a 4 to 1 ratio, are available, ranging from the low of 206-825 rpm to a high of 540-2160 rpm, with a three-phase, 60-cycle motor. A speed chart on the side of the machine shows proper speeds for different drill sizes.

Sibley Machine & Foundry Corp., South Bend, Ind.

Using Unfamiliar Alloys?

Here's How to Remove THE RISK

Today, when Government restrictions are enforcing the use of leaner alloys with unfamiliar heat treatment response, you'll find Ryerson Alloy Service more helpful than ever. The tests we make to assure quality, verify analysis and guide your heat treating are your best protection against costly production errors.

For example, we put every heat of Ryerson Alloy through four separate hardenability tests. The result: Positive knowledge of the hardenability of every shipment of Ryerson alloy. These tests enable you to buy on the basis of hardenability, in addition to analysis—*the only really safe way to buy alloys under today's conditions.* All test information—hardenability, analysis, etc.—is carefully recorded on a Ryerson Alloy Certificate which is delivered with your steel as a guide to heat treatment.

Don't take today's alloys for granted. Order by hardenability from Ryerson and be doubly sure. Some shortages are inevitable, but, as always, we'll do everything possible to meet your requirements. So, for any steel need, phone the Ryerson plant nearest you.

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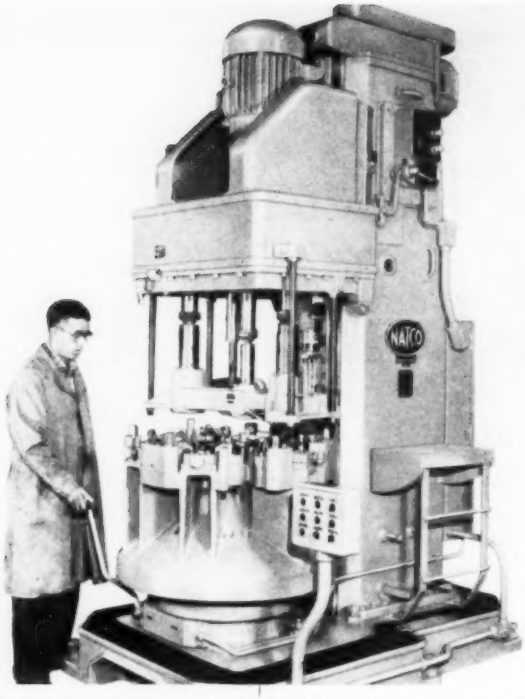
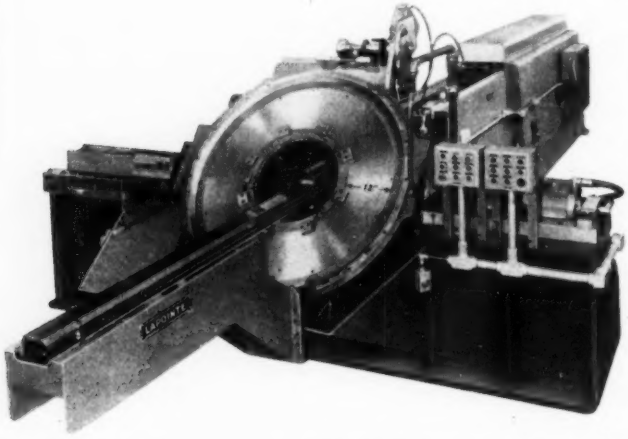
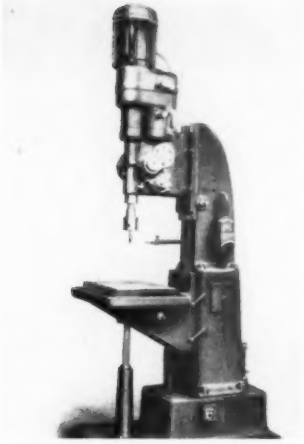
CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO



VERTICAL DRILLING MACHINE core drills, drills, and semi-finish reams 20 connecting rods and caps per hr. The machine has a flat slide upon which is mounted a fixed-center gear-driven head containing 4 spindles mounted in anti-friction bearings. The three-position, manually operated table is 24 in. in dia. A three-position fixture accommodates one connecting rod and cap in each position while performing the operations. — *National Automatic Tool Co., Richmond, Ind.*



ELABORATE FIXTURE on a conventional Lapointe horizontal broaching machine is specially designed for the broaching of stator rings. It is for rings from 38 to 48 in. in dia. 40 to 100 slots are broached at a speed of 25 sec per slot. The fixture has an adjustable travel of 15 in., hydraulic index, hydraulic plunge, and fully automatic lubrication.— *Lapointe Machine Tool Co., Hudson, Mass.*



Automatic Tapping Machines

These tapping and threading machines are entirely automatic; they have positive electrical controls, exact limitation of feed depth, wide range of speeds, and high output. There are no reversing gears and clutches. They are spindle fed at pitch of thread being cut.

The type UG 0 is designed for cutting the smallest threads, such as are used in the electrical and instrument-making industries. The other models are the UG 1, UG 2, UG 3, and UG 5. Maximum threads cut in steel are, respectively, 3/16, 5/16, 1/2, and 1 3/16 in. Capacity of chuck for each model are: 0—15/64, 5/32—7/16, 3/16—5/8, and 1/4—1 in. Min pitch cut: 0.01, 0.012, 0.02, and 0.025 in. Max. travel of spindle is: 1 1/2, 2 3/16, 3 1/8, and 4 in.

Carl Hirschmann Co., Manhasset, N. Y.

Line of Waterproof Controls Available From Clarostat

These waterproof controls are supplied in a wide range of resistances and wattages, and have been especially designed for use in miltary assemblies.

A rubber O-ring is used on the shaft creating a watertight seal which will withstand pressure equivalent to a 6-ft head of water. A similar rubber O-ring is used on the mounting surface of the bushing to perform the same function.

The rings are a rubber compound of special design to meet the extreme temperature requirements and are resistant to oils and greases.

Clarostat Mfg. Co., Inc., Dover, New Hampshire

ANYBODY
can weld it!

MAGNESIUM

That's right! If they can weld any metal, they can weld magnesium. Nearly all of the common welding techniques can be employed. Inert-gas shielded arc welding, gas welding, and electric resistance welding are all being used successfully on magnesium.

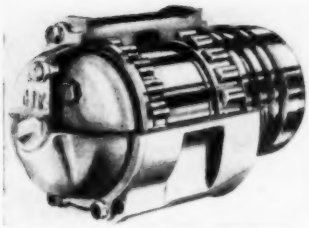
Most forms of magnesium are weldable. While joint strengths will vary with different alloys, typical properties of welded butt joints show tensile strengths up to 42,000 psi. and elongation up to 12%. In addition, magnesium welds are comprised of dense metal and are substantially free of microporosity.

The combination of relatively high weld strength and minimum specific gravity found in magnesium generally permits the design of welded magnesium structures that are lighter, stronger, and more rigid than is possible in other light metals. Dow has over 30 years of experience in the production and fabrication of magnesium —a call to your nearest Dow sales office will put this knowledge at your disposal.

THE DOW CHEMICAL COMPANY

Magnesium Department • *Midland, Michigan*

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland
Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada



Roller-Bearing Journal Boxes For Freight Cars From Hyatt

These journal boxes have been designed to fit conventional freight-car trucks with both the integral-box and pedestal-side frames. They can be installed to replace existing plain-bearing equipment, with only a minimum of alteration to the truck-side frames.

Hyatt journal boxes for freight cars are grease lubricated. The straight-radial bearings give maximum load-carrying capacity in the space provided. Thrust loads are taken against liberally proportioned race flanges. Straight-radial construction of the bearings permit car axles to float laterally within predetermined limits, cushioning sidewise shocks and reducing the wheel-flange wear.

All bearing and box parts are completely accessible for cleaning and inspection. Both journal boxes and bearings can be removed from car axles without breaking race fits.

Integral-box side frames can be reversed top to bottom to present a new-wear surface in the bearing-load zone for longer life.

Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

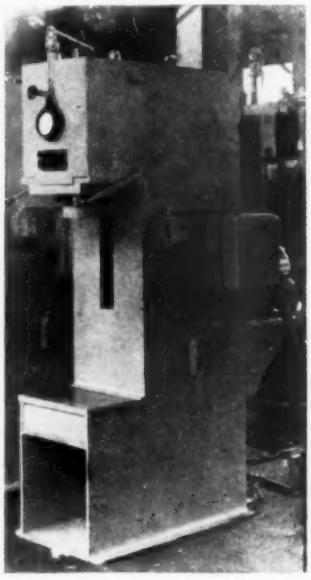
Helical Router Bit Is Carbide Tipped

The helical router bit is so designed that the carbide-cutting edge has a compound radial and helical angle that gives a downward-shearing cut, requiring less effort in the cutting and adding life to the tool.

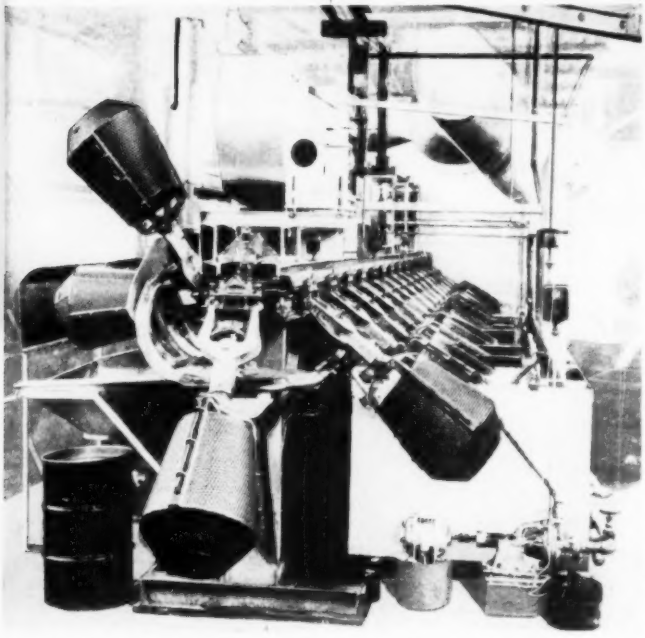
Intended for use on laminated-plastic tops, the particular cutting action developed prevents any tendency of the plastic to lift away from the core. It is claimed the Helicoid Router Bit has shown up to 2½-times the life of the usual carbide-tipped straight-angle bit.

It is stocked in ¼, 5/16, ⅜, 7/16, and ½-in. shank sizes and is available for immediate delivery.

North American Products Co., 3100 W. Cherry St., Milwaukee, Wis.



GAS CHECK PRESSES, C-frame with double-acting ram, used in ammunition assembly. After live fuze is inserted in the shell, soft metal-sealing plugs are compressed under high pressure to insure against premature exploding due to powder flash. Double safety levers are used.—*Elmes Engineering Div., American Steel Foundries, Cincinnati 29, Ohio*



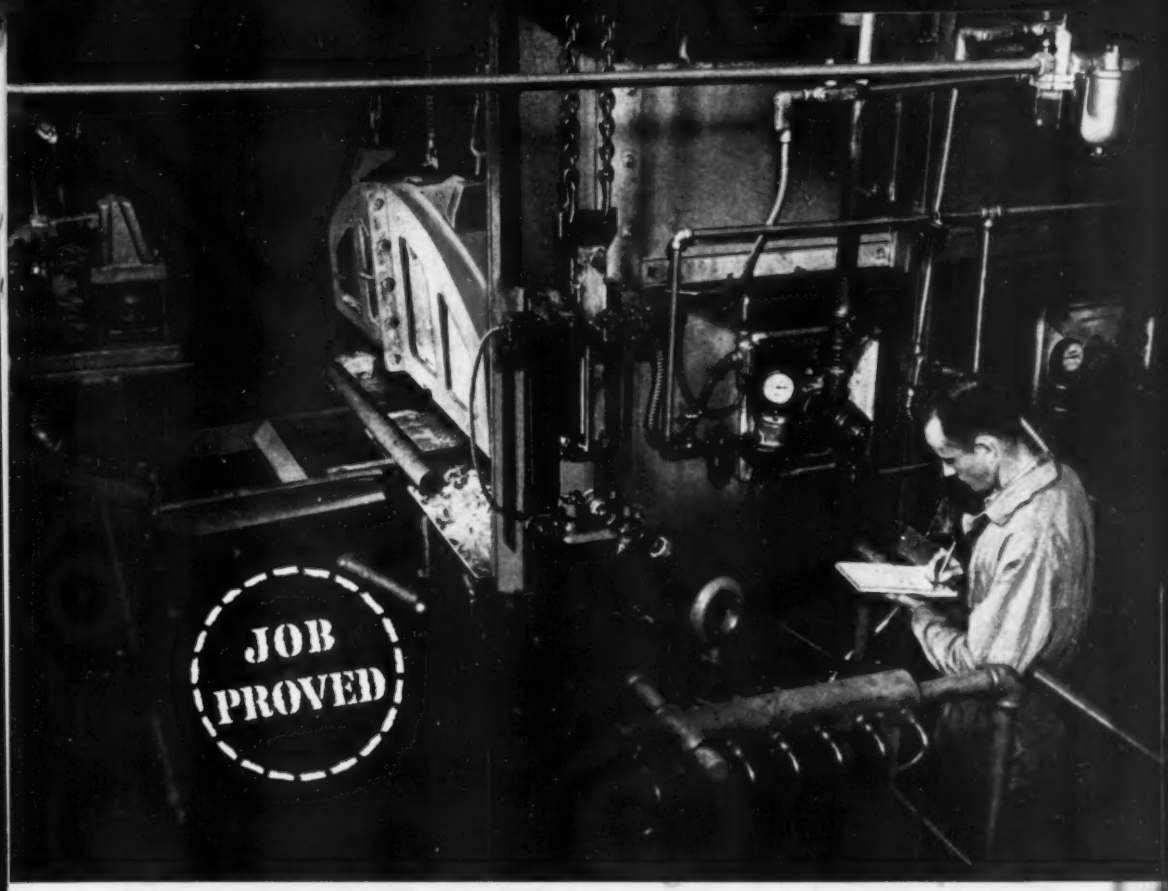
AUTOMATIC BARREL-PLATING and processing machine, with barrels revolving continuously through the entire cleaning, plating, rinsing, and drying cycle. A mechanical loader is available as optional equipment. The only manual labor required is loading the barrels.—*Frederick B. Stevens, Inc., Detroit, Mich.*

Heavy-Duty Stapling Gun For One-Hand Operation

This sturdy, pocket-size stapling gun is the first one-hand stapler capable of fastening metal or fibre shipping tags to export boxes. It is said to do the job in one-fifth the time needed for hammer and nails.

The operator holds the tag in place with one hand, then shoots staples as fast as firing a Colt automatic. The staples are five times normal size, and grip the wood securely with a clinch-locking feature. The gun has a 10-year guarantee.

The Heller Co., 2153 Superior Ave., Cleveland 14, Ohio



HYDRAULIC SYSTEM KEPT LIKE NEW

Sunvis 916 Effects Substantial Savings; Strainers and Lines Kept Sludge-Free

A copper tubing manufacturer uses an oven with hydraulically operated doors to heat billets to approximately 1550F. The ambient temperatures around the hydraulic mechanism are abnormally high, putting the hydraulic fluid to a severe test of stability. Failure of the system would halt the piercing operation and result in costly delays throughout the plant.

Since the oven was first put in operation, three years ago, the hydraulic fluid has been Sunvis 916. The original charge has never been changed and is still in excellent condition, though the system is tight and requires only a minimum of make-up. Oil lines and strainers are completely free of sludge. Seals and packings are sound. Operations are never interrupted for oil changes or parts maintenance. The company expects to retain the original charge of Sunvis 916 in service indefinitely, effecting large savings in both oil and maintenance costs.

Sunvis 916 is a solvent-refined oil of the highest quality. It is fortified to resist the oxidation and sludging so detrimental to the efficient operation of hydraulic systems. Sunvis 900 Oils are *good for the life of your machines*. For your copy of the illustrated booklet "Sunvis 900 Oils", write Department AM-10.

SUN OIL COMPANY · *Philadelphia 3, Pa.*
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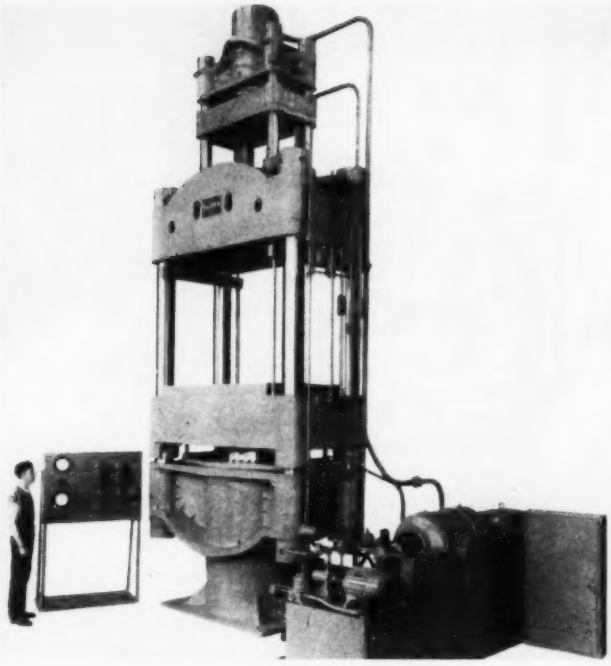
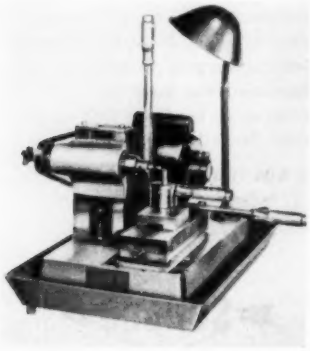


Press For Either Transfer Or Compression Molding

This combination compression and transfer molding press is equipped with special safety switches and has two pushbutton-control panels, one at the press and the other for optional remote operation.

Operation can be changed from straight compression to transfer molding by flicking a switch. In the compression cycle, the circuit is arranged to provide two breathe cycles, with openings controlled to ¼ in. Curing cycle is set by a motor timer and can be furnished with any required range. Pump is equipped with compensating control, so that during the curing cycle only the minimum horsepower is used. The mechanical knockout is hydraulically operated, and is fully automatic.

Elmes Engineering Div., American Steel Foundries, Cincinnati 29, Ohio



Bench Machine Interchangeable To Lathe, Miller, or Grinder

The Viking LMG-3 is a combination bench-production machine which can be set up for turning, milling, or grinding through simple changes in tooling. It features a common base, power unit, spindle, and vertical and horizontal slides to which special tooling and fixtures are added for the desired turning, milling, or grinding operation.

A complete set of tooling is available for conversion or the machines may be furnished as single-purpose units, where battery production-line operation is required. All attachments are engineered to operate with standard tools. Coolant system is optional.

Spindle speeds with standard pulleys are 825 and 3450 rpm. Additional range of speeds from 100 to 7000 rpm can be obtained with optional equipment.

The 1-in. spindle with No. 7 B&S taper hole is mounted in heavy ball bearings. Through hole is 13/32 in. dia. Spindle is adjustable vertically with max. 7-in. distance from centerline to worktable surface.

The motor is 1/3 hp, 1725 rpm, 60 cycle, 115/230 v, and the spindle drive is V-belt and pulleys.

Over-all bench space required is 11 x 18 in., table working space is 6 x 9½ in.

Viking Industries, 220 Montague St., Rockford, Ill.

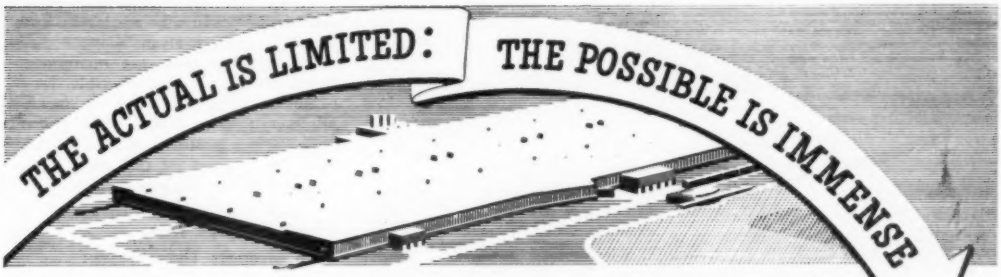
Dillon Tens-O-Trol Measures Weight, Tension, and Traction

This equipment has been designed for the purpose of measuring tension, weight, or tractive loads remotely. It is electro-mechanical in function and is now equipped with oversize selsyn motors for added torque and dependability.

Readings are based on movement of a calibrated dynamometer beam transmitted to shaft of selsyn motor—transforming mechanical movement to electrical. It is equipped with 12 different capacity ranges, from 0-500 lb, up to 0-50,000 lb. Two repeater stations may be used with each transmitter. Accuracy is plus or minus 2% full scale deflection.

The cabinet is made of heavy gage steel and is 9-in. wide, 11¾-in. high, and 5-in. deep. The transmitter weighs 9 lb; the repeater station 12 lb. Either 1 or 2 repeater stations may be used with each transmitter dynamometer as desired. Distance between repeaters can be varied.

W. C. Dillon & Co., Inc., 1421 S. Circle Ave., Forest Park, Ill.



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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STEEL DESIGN SAVES MATERIALS AND MAN-HOURS . . . CUTS COST 60%

WHEN a design utilizes the economies of welded steel, it can be produced for less cost because:

With welded steel, material costs are less. Only 50% to 25% as much metal is required. And, pound for pound, steel costs 75% less, giving an initial 7-to-1 cost benefit with which to start your designs.

With welded steel, fewer man-hours are needed for fabrication regardless of quantity produced. Smaller lots can be manufactured economically using simple tools. As quantities increase, designs can be modified further to replace some welding with bending, thus further reducing production costs.

Wherever costs with steel designs are higher, invariably the designs have fallen short of achieving the ultimate in savings possible with arc welding, or the products have been "over-designed." A restudy of every design by production engineers, before it becomes "frozen" for manufacture, helps eliminate costly details.

Your Lincoln Welding Engineer will gladly assist in analyzing your product requirements to cut costs.

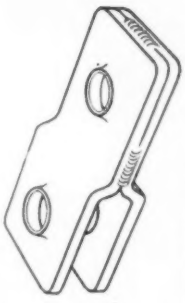

Fig. 5—Steel Stamping *from light gauge metal is formed in a die and welded. Weight is cut to 2 pounds . . . cost to 22¢ . . . a saving of 62% over Fig. 2. Saves 85% over Fig. 1.*

Fig. 4—Saves 16% Cost *over Fig. 2 by replacing tubing with simple "U" formed from hot steel strap. Holes are prepunched prior to welding. Weighs 3½ pounds . . . costs 49¢.*

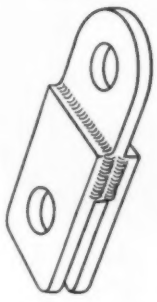

Fig. 3—Uses Sheared Steel Strip *to cut 10% from production costs, as compared with Fig. 2. Requires only simplest of fabricating equipment. Weighs 3 pounds . . . costs 54¢.*

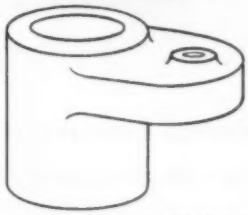

Fig. 1—Original Design. *Machine clevis weighs 7 pounds . . . requires drilling, boring, reaming and spotfacing operations. Costs $1.45 for material and labor.*

Fig. 2—Welded Design Saves 60% Cost. *Fabricated from tubing and steel strap. Needs only fast, simple punching operation. Weighs 3¼ pounds . . . costs only 58¢.*

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increasing the YIELD

the IMMENSITY of the POSSIBLE

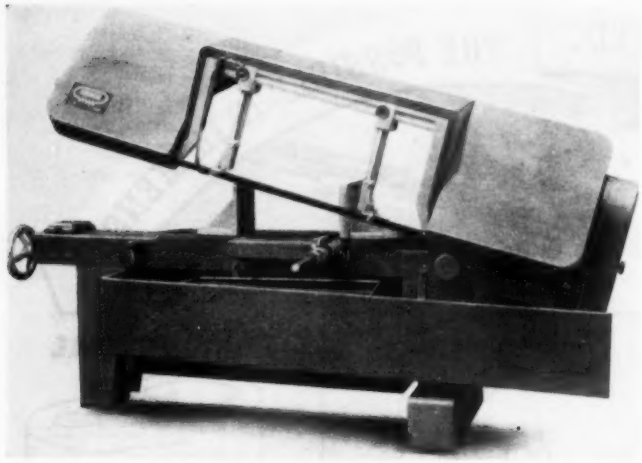
Lower Costs Regardless of Quantity Produced

SEE HOW STEEL DESIGN CUTS COSTS STILL FURTHER

Machine Design Studies are available to designers and production men. Write on your letterhead to Dept. 109

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 1, OHIO



Metal-Cutting Band Saws For High-Speed Production

Specifications		
Capacity..	Dry cut	12 in. plus round stock
	Wet cut	12 x 20 in. flat stock
Motor		1 hp
Floor space		87 x 26 in.
Height to bed		25½ in.
Band wheels		18 in.
Vise swivel leaf		45°

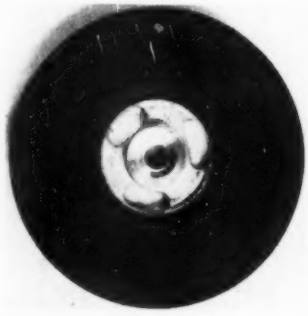
The metal-cutting band saw is produced in two models, one for dry-cutting on intermittent operation or for non-ferrous metals and the other coolant equipped for continuous high-speed cutting. Except for the coolant equipment both machines are identical.

It cuts to an accuracy of a few thousandths, with no burr and minimum kerf, and maintains its precision from start to finish of the cut. The machine has four cutting speeds, 61, 108, 165, and 259 fpm, a four-step cone pulley on the motor and drive shaft providing the variations. This gives a wider choice in matching the cutting speed to the material and cut size. Changes to the different speeds are fast and easy. Power on the saw is automatically cut off at the end of each cut.

A 1-in. blade, 13 ft 11 in. long, is used for faster cutting. Frame counterbalance is adjusted by a cam device having five spring tensions. Double-opposed brush and blade-guide assemblies on either side of the blade keeps the blade free from chips and in alignment. Blade-guide bearings are New Departure roller bearings.

All wheels and moving parts are enclosed, the only part of blade exposed is the cutting section. Although weighing 1100 lb, coolant equipped, the machine is readily portable by means of casters, two stationary and one swivel. It has tripod legs so that it has a firm setting on any floor. Quick (½ min.), easy blade changes are afforded from the top or working area of the machine.

Machine Tool Div., Kalamazoo Tank & Silo Co., Kalamazoo, Mich.



Backing Pads Keep Sanding Disk Cool

Spiralcool is made of layers of rubber reinforced with fabric and securely bonded to a slotted aluminum hub. The slots in the hub are shaped in such a way that they force air through to the back of the sanding disk, keeping it cool under the most severe usage and also adding to its life by keeping it clean.

The backing pads are manufactured in three grades: Flexible, for contour sanding; Medium, for operations requiring a semi-rigid pad; and Rigid, a stiff pad for edge sanding.

Spiralcool Co., Bellevue, Ohio

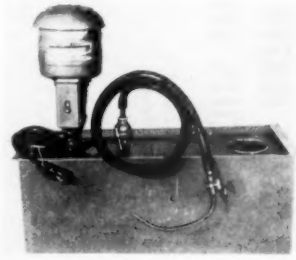
Alcoa Develops Alloy 10% Stronger Than Present

Designated XA78S, an aluminum alloy developed by the Aluminum Co. of America, has been released to the aircraft industry for experimental and controlled production use only.

The main alloy composition is the same for both 75S (Alcoa's comparative aircraft alloy) and XA78S in that they are of the aluminum-zinc-copper-magnesium family. However, the new alloy is approximately 10% higher in tensile and yield strengths with about the same elongation and fatigue properties. Limited tests indicate that the increase in mechanical properties will involve some sacrifice in workability.

For the present, the new alloy will be confined to the production of sheet and plate—in both bare and Alclad forms—and extrusions.

Aluminum Co. of America, Pittsburgh 19, Pa.



Portable Coolant Unit Can Feed 3 or 4 Machines

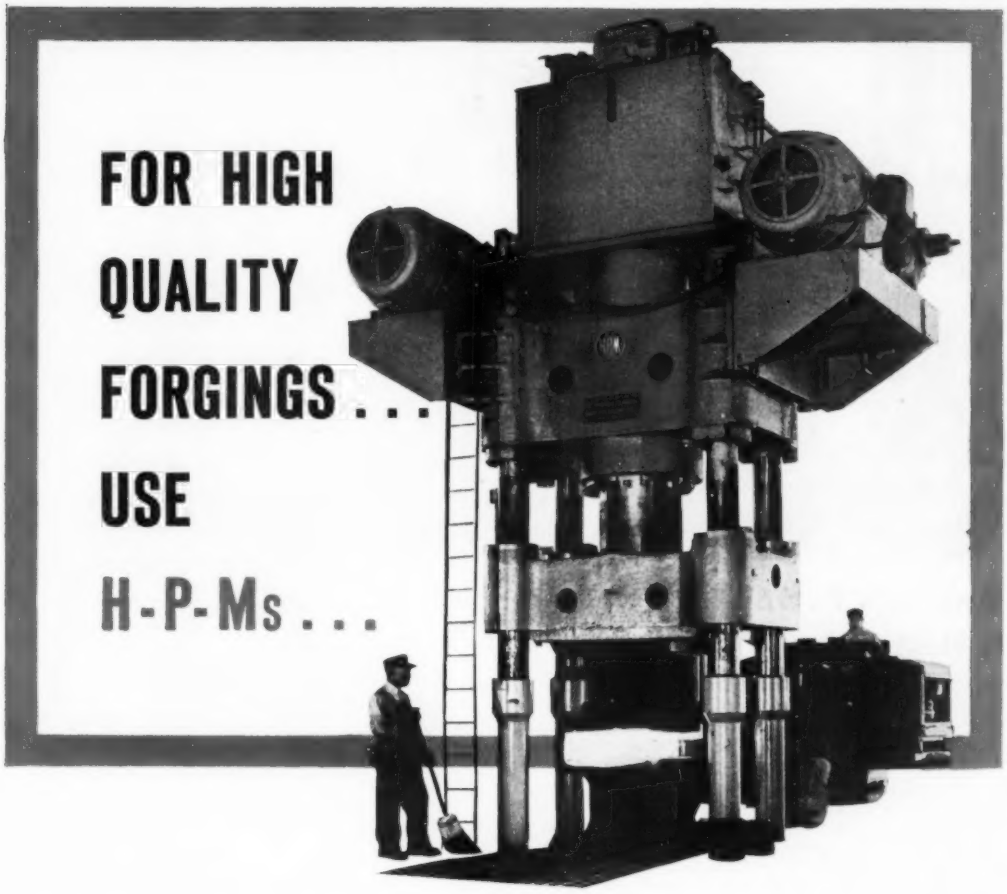
A portable coolant unit originally designed to furnish sufficient cooling for an eight-spindle drillpress will also operate efficiently on practically any other machine tool. It supplies 30 gallons per minute and will pump up to 12 ft.

The motor used is a ¼-hp, 110-v, 60-cycle, 1725-rpm, GE or equivalent.

The self-contained unit holds 11 gallons and measures 10 x 10 x 26-in. long. It comes complete with chip screen equipped with shut-off and flexible nozzle.

Shellback Mfg. Co., 1320 East Elza, Hazel Park, Mich.

FOR HIGH QUALITY FORGINGS . . . USE H-P-Ms . . .



Speed, flexibility, versatility and a high degree of control make the H-P-M "All-Hydraulic" press the ideal machine for diversified forging work. These features have played an important part in the successful operations of many H-P-M forging press users—such as Cameron Iron Works billet shaping job pictured above in Houston, Texas. H-P-M presses are ideally suited for hot forming and trimming and most important currently, for piercing, drawing and nosing artillery shells.

The hundreds of H-P-M presses now serving the metal working industry have been selected because of their exclusive operational features: FASTRAVERSE "closed circuit" hydraulic operating system . . . quick, easy adjustment and control of press speeds, strokes and pressures . . . features that mean long die life and production with virtually no rejects. Find out what H-P-Ms can do on your production problems by calling in an H-P-M engineer today.

Write today for your free copy of Bulletin 5005 describing H-P-M FASTRAVERSE metal working presses.

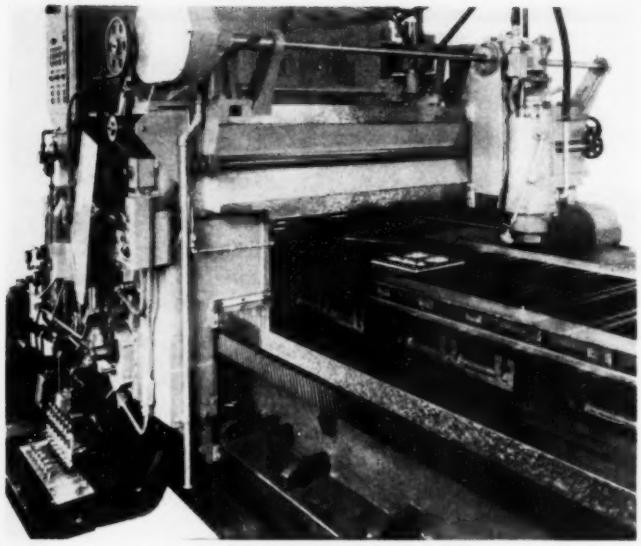
HPM

THE HYDRAULIC PRESS MFG. CO.

1002 MARION ROAD - MT. GILEAD, OHIO, U. S. A.

Makers of Presses for the Metal Working and Processing Industries - Plastics Molding Presses - Die Casting Machines - Hydraulic Pumps, Valves and Power Units.

SERVING INDUSTRY THROUGH HYDRAULICS



Onsrud's Power-Feed Router Is Electronically Controlled

The Onsrud InvoMill, an automatic, electronic - controlled power - feed router and skin mill, permits routing of thicker stocks of aluminum and other non-ferrous metals than heretofore possible with standard hand-feed routers. Chief application of the machine will be in the making of grids which hold gas tanks and other parts inside aircraft wings. Grids eliminate complicated internal bracing and fabricating, speeding up production.

A 30-hp motor supplies the power for routing aluminum stock 1 in. or thicker. For skin milling of large aluminum pieces used to form wings, a 40-hp, 5400-rpm direct-driven, liquid-cooled motor, mounted on the cross rail, provides the power. Both motor and cross rail may be tilted to varying degrees providing a combination of angles without the use of sine plates.

The InvoMill is available in three table widths: 72, 84, and 96 in. with bed lengths furnished in multiples of 15-ft sections plus 7 ft for conveyor.

Onsrud Machine Works, Inc., Chicago, Ill.

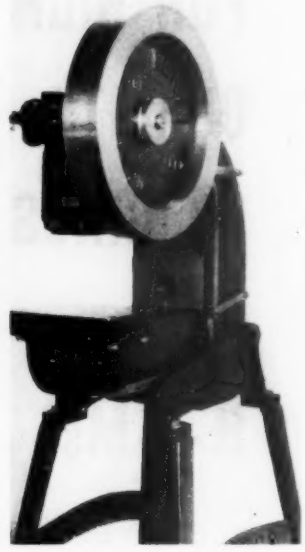
DryRod Electrode Oven Has 250-lb Capacity

The DryRod Electrode Oven is a portable heated-storage unit which provides control over the moisture content and temperature of electrodes at their point of use, and also aids in stock-level control.

The oven is said to control moisture within 0.2%, the normally accepted Government standard. It is basically a cylindrical, compartmented sheet-metal unit, heated by an 840-watt element off a 110/220-v circuit. It is fully insulated for low-heat loss and uses a variable thermostat for temperature control up to 600 F.

Dimensions are 22-in. OD x 25½-in. long, with a capacity of 250 lb of electrodes up to 18 in. in length. Shipping weight is 112 lb.

Philip Roden Co., 1721 E. Lake Bluff Blvd., Milwaukee 11, Wisc.



Variable-Speed Punch Presses Rated at 5-Ton Capacity

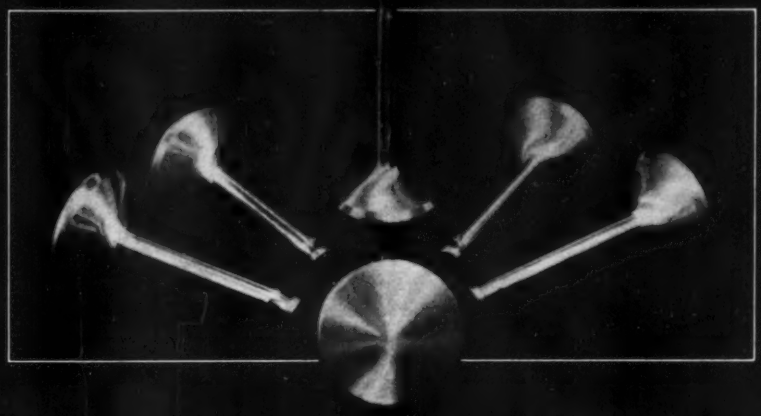
Two 5-ton power presses, the Standard variable speed and the 4-in-1 with ram speeds, have been developed by the Kenco Mfg. Co. These presses are said to do the work which normally required more expensive back-gear presses or larger-capacity presses with slow ram speeds.

An 18-in. dia, 110-lb flywheel supplies the momentum needed for the slow-speed operation, while ram speeds can be varied from 95 to 290 strokes per min by adjusting the ¾ to 2½ in. dia of the variable-speed motor pulley.

Other features include a one-piece, 1⅛-in. crankshaft, a 1-in.-dia clutch-drive dog built into the clutch collar, large V-type ram guides, oversize ram area, and an adjustable brake. The press can be switched form single to repeat operation instantly, without stopping the motor. An adjustable bed permits conversion to a long, half, or horn punch press. The 12¾-in. throat permits punching to the center of a 24½-in. circle.

Operations include deep drawing, piercing, and blanking.

Kenco Mfg. Co., 5211 Anaheim-Telegraph Road, Los Angeles 22, Calif.



When minimum specs hit tops...

RADIOGRAPHY helps meet them

Newest developments in piston aircraft engines put stern demands on exhaust valves. Specifications have climbed toward perfection. Even a tiny irregularity, chip, fold, or flaw cannot be tolerated.

So the manufacturer radiographs each valve. It is the one way to disclose internal conditions without destroying the part—the one way to release only products of highest quality.

Radiography has become a dependable means of gaining a reputation for constant top-quality work. It forestalls imperfect products—frequently suggests changes in operations that assure higher yields in production runs.

Ask your x-ray dealer to show you how radiography can increase your production and improve quality. Send for a free copy of "Radiography as a Foundry Tool."

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X-ray Division
Rochester 4, N. Y.

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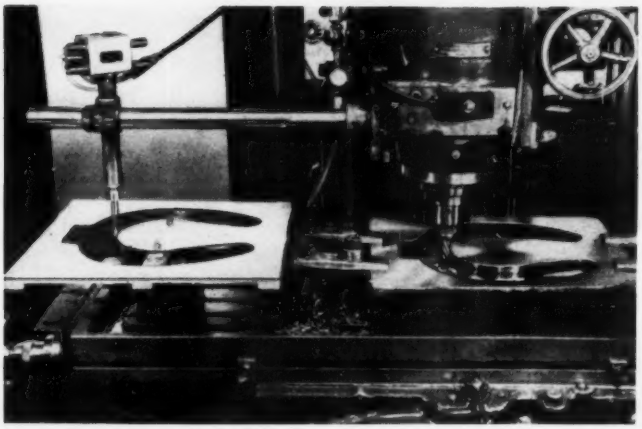


Duplicating Attachment For Automatic Contour Machining

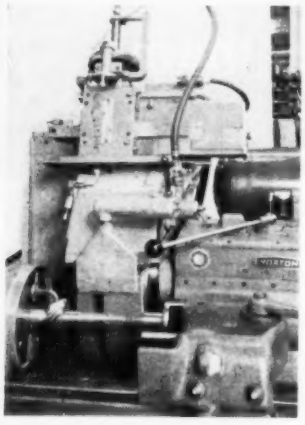
The Duplicator is an attachment for standard machine tools that will enable them to follow a templet or model, thus performing automatic-contour milling, turning, boring, and shaping.

Duplicating is accomplished by the electric tracer controlling hydraulic motors. These motors are attached directly, or coupled, to the feedscrews of the machine tools. Operation is said to be simple, accurate, and as fast as the particular cut will allow on a production basis.

The attachment can be permanently added to a machine without interfering with normal operation or can be moved from machine to machine as the need arises. Action is automatic and simultaneous.

The Duplicator is manufactured by The Lodge and Shipley Co. of Cincinnati, Ohio, but is distributed by the Tracer Control Co.

Tracer Control Co., 595 East Ten Mile, Hazel Park, Mich.



Norton Automatic Device For Grinding-Wheel-Face Truing

An automatic grinding-wheel truing device is available from the Norton Co. for use as an attachment for its cylindrical grinding machines.

The device performs angular, step, straight or combination formed-wheel-face truing at the touch of a pushbutton, thus eliminating operating burden normally involved in performing these functions with non-automatic equipment. The diamond-truing tool which is located inside the wheel guard above the wheel, makes a round trip at a predetermined feed and speed across the wheel face when the device is actuated. Changes in speed and feed are quickly made whenever desired. The rate of speed of diamond travel when not in contact with the wheel is automatically increased to reduce the over-all truing time.

The truing device permits a close control of the amount of abrasive removed from the wheel, thus reducing wheel-cost per piece ground. It also trues the wheel without disturbing the table setting and without special positioning of the wheel head.

It is claimed that consistency of result obtained by automatic-mechanical wheel truing makes possible improved accuracy and uniform quality of finish.

Norton Co., Worcester 6, Mass.

Fork-Lift Truck From Buda Has 1-Ton Capacity

Rated at 15- and 24-in. load centers, the Buda pneumatic-tire 2000-lb. capacity fork trucks are said to have many features for fast handling, operating economy, and low maintenance.

Features of the two models include: carriage mounted on adjustable-side thrust rollers to eliminate wear; extra-strong self-aligning masts; single-lever two-speed-forward and two-speed-reverse gear shift. The truck has a complete complement of gages and switches on a full-front-vision instrument panel. It uses a quick-change heavy-duty clutch.

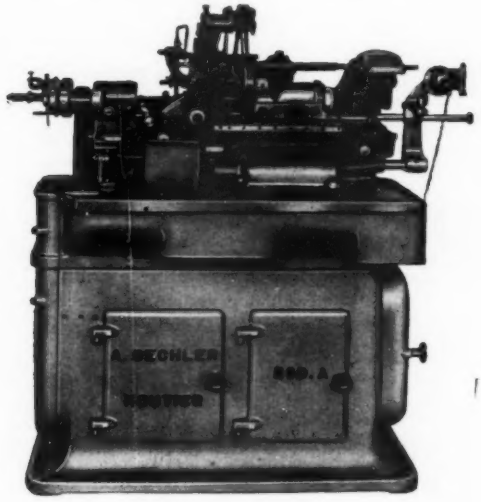
They are powered by a 4-cylinder, 61-cu-in.-displacement engine and are available in five standard masts with a lift of 72, 84, 108, 114, and 120 in. The truck is equipped with a built-in mechanical governor rated at 2400 rpm, variable speed.

The Buda Co., Harvey, Ill.

A bright-zinc process, BSZ-300, is said to be a simple, economical method of producing bright to brilliant deposits directly from the plating bath. Bright dipping is not essential. It is based on the use of an additive to the regular cyanide solution to make a brighter finish last longer, and increase the resistance to oxidation and tarnish. The finish readily accepts conversion coatings and can be soldered with comparative ease.

Hanson-Van Winkle-Munning Co., Matawan, N. J.

MEET HIGH PRECISION *DEMANDS* *with* BECHLER SWISS AUTOMATICS



Model A-10 BECHLER AUTOMATIC has 3/8" diameter capacity, 2¾" turning length, 5 cross tools. This Automatic is equipped with single spindle threading attachment and slotting attachment for producing PRECISION SCREWS.

The advantages of using BECHLER AUTOMATICS to speed production:

1. Over 20 spindle speeds.
2. 88 camshaft speeds for each spindle speed selected.
3. More than 30 different attachments.
4. A new device prevents the breaking of carbide tools.
5. Easiest tool adjustments.

DIAMETER CAPACITIES

BECHLER AUTOMATICS

Model AS	5/64"	5/32"	9/32"	3/8"
Model A	—	5/32"	9/32"	3/8"
Model B	1/2"	5/8"	3/4"	—
Model C	1"	1¼"	—	—

BECHLER ISOMATICS

Automatics for constant and highly accurate production of very small parts.

Model AS	5/64"	5/32"	9/32"
Model A	—	5/32"	9/32"

OTHER BECHLER MACHINES . . . MODEL CF CAM SHAPERS • SIMPLEX AND DUPLEX PINION CUTTING MACHINES

ADDITIONAL SERVICES

- ATTACHMENTS, SPARE PARTS, CAMS available from New York Stock
- TOOLING SERVICES for planning layouts and set-ups and for making cams and tools

SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

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405 Lexington Ave., New York 17

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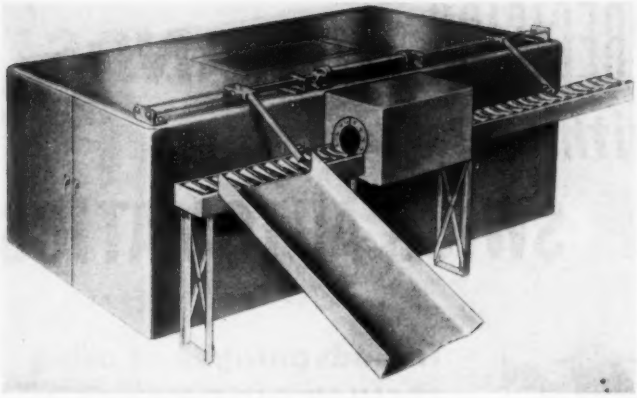


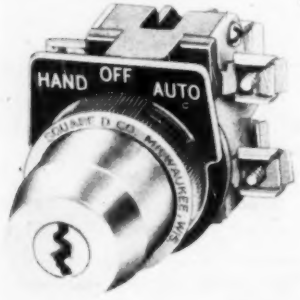
Loftus Induction Furnace Provides Uniform Heating

A 60-cycle induction furnace for the heating of non-ferrous metals and some applications of steel is said to provide uniformity of heating and assure balanced-electrical loading from a 3-phase line.

The process involves a transformer which converts balanced 3-phase power into 2-phase operation. Two closely interlaced coils, leading off this 2-phase line surrounds the billet and provides all the characteristics of uniformity and through penetration of single-phase heating. Eddy currents are caused to flow in the billet to be heated insuring fast, clean, uniform heating for forging, extrusion, and rolling. Output may be varied to suit requirements.

The furnace itself is built to the customer's specifications and is designed for any size or shape of billet and may be equipped with as many coil units as are necessary to meet production requirements. The furnace is ideal for shrinking steel, such as permanently attaching steel jackets to steel shafts.

Loftus Engineering Corp., 610 Smithfield St., Pittsburgh, Pa.



Key-Operated Selector Switch Available From Square D

A key-operated selector switch for oil-tight control units is available as a two- or three-position switch with a variety of cams and contact blocks to meet the switching requirements of any application.

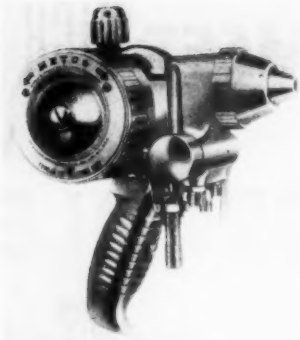
Class 9001 TSK key-operated selector switches are said to be suited for applications where operation in all or certain positions of the unit must be denied to unauthorized personnel for safety or other reasons.

Every possible combination of key withdrawal (locking) positions for two- and three-position selector switches is available.

Square D Co., 4041 N. Richards St., Milwaukee 12, Wis.

Kling-Oil is a general-purpose machinery oil having the unique feature of metal adhesiveness. It is tacky and clings to the moving parts of the machinery. It reduces the number of oilings required (up to 5 times is claimed), because of its staying quality and reduced spattering and dripping. No gumming or build-up is experienced after continued use. It has a viscosity of SAE-30 and may be used anywhere that such oils are applied and used by the same methods.

Magnus Chemical Co., Inc., Garwood, N. J.



Metallizing Guns Spray At High Speeds

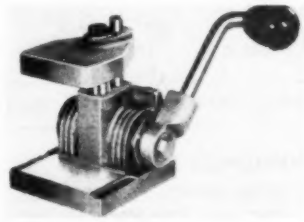
The metallizing guns, Type 4E for machine-element work, and the 5E for corrosion-protecting coatings are said to develop the highest spraying speeds in hand-held guns.

They use a jet-siphon principal in the gas head which automatically compensates for variations as high as 10 lb in gas pressure and provides a steady, unvarying flame which produces uniform coating.

The 4E gun is designed to spray all wires from 20 B&S gage to ⅛ in. in any metal—carbon steels, stainless, Monels, or bronze. The 5E gun is designed for high-speed spraying of the softer metals, such as zinc and aluminum, and for protection against corrosion. It sprays 3/16-in. wire and will deposit as much as 55 lb of zinc per hr, aluminum 15 lb per hr.

Either gun may be mounted for use on a lathe or other machine in production-line work, or may be used in hand-held operation. They weigh only 4 lb, 12 oz.

Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.



Single-Post Drill Jig Uses Touch-Release Locking

Called the Esco Mijit B-6, the single-post drill jig is recommended by the manufacturer for drilling small parts and for short and medium runs

Shown here are representative sizes from the complete line of I-R Air Impactools designed to meet all nut-running requirements.

A mid-western manufacturer of materials handling equipment saved $10,000 in one year by installing Ingersoll-Rand Air Impactools on an idler assembly nut running job in his plant. The installation of the Impactools and accessory equipment cost $1200, which quickly paid for itself in 33 days!

Similar time and labor savings can be made in your plant, on your jobs. Air Impactools are available in thirteen sizes to handle nut running jobs up to 4" bolt size. The smallest Impactool, for work up to 7/32" bolt size, weighs only 1⅜ pounds; the twelve larger sizes are correspondingly packed with top power per pound.

You get no tiring and wasteful kick or twist with an Impactool . . . full power is delivered to the work . . . quickly running up or removing nuts and screws. Ingersoll-Rand, *originator of Impactools*, has manufactured these sturdy and reliable machines for 18 years. Today they are in use in thousands of plants around the world, saving countless dollars and hours. Call, write, or wire your Ingersoll-Rand branch office—an Air Power Specialist will be glad to give you complete details, or arrange an eye-opening, dollar-saving trial or demonstration in *your* plant.

AIR POWER ... The Key to Lower Production Costs

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The grinding department has them stepping!

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Grinding Wheels

More assemblers needed . . . and it's simply a matter of cause and effect. The cause—Simonds Abrasive Company Grinding Wheels! The effect—more production turned out faster. Put more "prod" in *your* production with Simonds Wheels. They're part of a complete line including grinding wheels of all shapes and sizes, mounted wheels and points, segments and abrasive grains . . . accurately specified for your jobs . . . and made by Simonds Abrasive Company, a major grinding wheel producer for almost 60 years. Write for grinding data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

where more costly fixtures and tooling cannot be justified.

The jig provides an infinite number of locking positions through a cam action. Loading and unloading takes only seconds. Locking is positive and requires no pressure, yet releases instantly with a slight lift of the locking handle.

Base and top plate are closely machined, as is the right angle of back to base for optional use in a side or lying-down position. Accurate alignment between bushing plate and base is maintained by means of a hardened and ground post and alignment dowel. The post also serves as a raising and lowering rack with a 1-in. stroke.

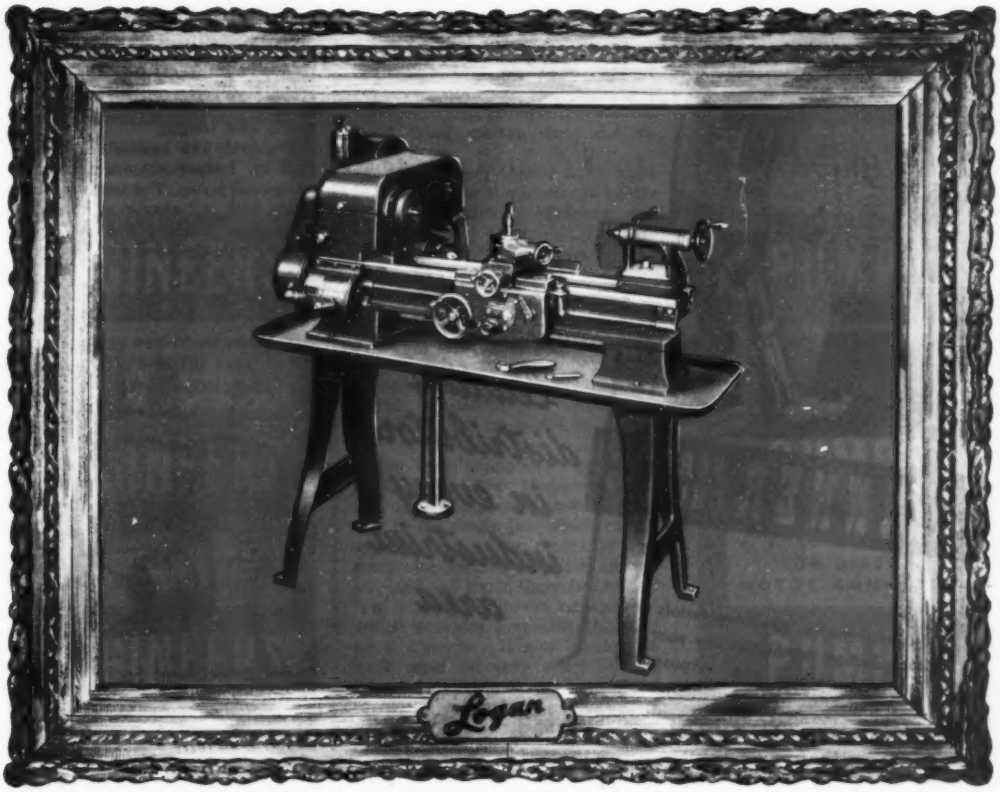
Full-size templets are available without charge. Adapters and bushing plates can be supplied from stock.

Esco Engineering Corp., 1940 E. Woodbridge, Detroit 7, Mich.

Grab Automatically Adjusts To Coil Size and Locks

A crane operator using the Dixon Coil Grab can lift a coil from the pallet to a vertical position in one easy motion, according to the manufacturer.

A prong tapered to fit between the coils, in the space made by the coil bands, is positioned while the opposite jaw is placed in the center of the coil. As the crane lifts the



Logan 920
Quick Change Gear Screw Cutting
Lathe 11" Swing, 1" Collet
Capacity, 1⅜" Spindle Hole 24"
and 36" Between Centers

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Accurate in Every Lathe Operation

With Logan Lathes you are ready for every type of lathe operation. Heavy cuts, tool room precision jobs, high speed production runs and large volume second operation work are all routine Logan assignments. Versatility is inherent in the Logan ball bearing spindle with its wide speed range and sustained accuracy; in the accurate, rugged overall construction of Logan Lathes; and in the full line of Logan Lathe attachments. 11" swing, 1" collet capacity and 1⅜" spindle hole are typical of the specifications which make these accurate Logans capable of handling a high percentage of any shop's lathe turning. Easy to set up, simple to operate, frugal with power and durable, Logan Lathes economize every way you use them. In fact, no other lathe of comparable specifications can match the Logan in economy.

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LOGAN ENGINEERING CO.
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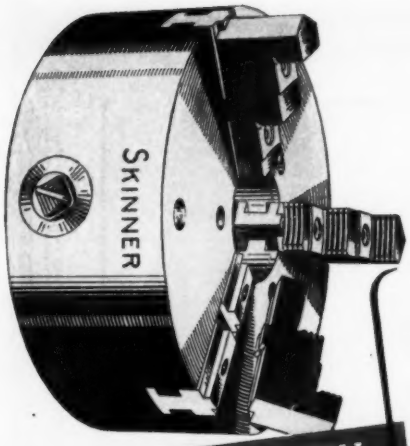

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Finest engineering, quality materials and latest production techniques are your assurance that nothing can surpass the quality of Skinner Chucks. Whether you are a builder or user of machine tools, you should be sure that none of the basic accuracy of your machines is lost through "second-best" chucking equipment. The Skinner trade-mark denotes "The Crest of Quality," and your nearby Skinner distributor is ready and willing to show you the quality features inherent in the complete Skinner line. Ask him for the Skinner Catalog, or write direct to the company.

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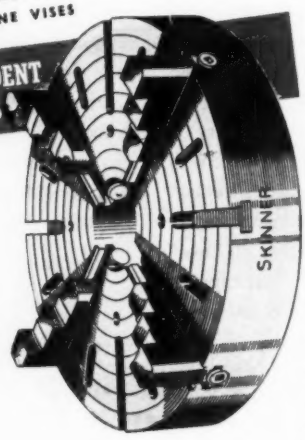

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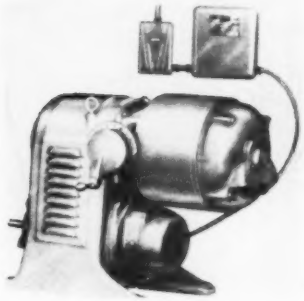
Connecticut

grab automatically adjusts to the coil size and the tapered prong slides between the coils. As the coil lifts the grab turns to allow the coil to move to a vertical position, locked by its own weight.

The grab can handle coils up to 2000 lb. Larger sizes are available on special order. The finish is black oxide with red enamel trim.

Materials Handling Div., Dixon Research, Inc., 2305 23rd Ave., Rockford, Ill.



Brake Attachment For Varidrive Motors

The brake used, a Warner ICB, is mounted directly on the variable-speed shaft, and eliminates transmission of the braking action through the belt. It is said to be ideal for inching or jogging as the shockless operation produces a constantly increasing torque while stopping.

Containing few parts, the brake has a mechanical movement of only 1/16 of an in. and the frictional force is controlled directly by the magnetic action of the brake. The braking torque can be permanently set or for diversified operations, adjustments can be made through a knob-controlled rheostat.

Adaptable to both U. S. Varidrives and Varidrive-Syncrogears, the brake is dc-actuated with low-power requirements—25-35 watts maximum. Power-conversion units can be used where ac voltage is supplied.

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.

Electrode Holder Added To Welding Accessory Line

A semi-insulated electrode holder has been added to the Caddy line of arc-welding accessories and is available in 300 and 500-amp capacity.

The unit uses a spring assembly to give uniform pressure when in-

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DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

serting or ejecting the electrodes. It is cooler operating due to the unique channel construction with its high heat-dissipation factor. There is a handguard that protects the welder's hand from spatter, arc, and reflected heat.

A solid-copper circuit from welding machine to the electrode holder provides electrical efficiency and eliminates hot spots.

Erico Products, Inc., 2070 E. 61st Place, Cleveland 3, Ohio.

Dual-Thread Comparator

The Dual-Thread Comparator is intended to provide a more thorough visual inspection of externally threaded parts up to 1½-in. diameter.

The same component parts are used as in the Hanson-Whitney Standard Comparator, but in addition to the single jaw which checks assemble-ability by means of one composite reading of pitch diameter, lead and angle, there is a second jaw with a two-thread engagement which provides a specific check of pitch diameter. It also checks the back taper on very short threads whose length does not exceed the major diameter of thread. This second check will also indicate presence of lead or angle errors. Both readings are taken visually on a single-dial indicator.

The comparator can be used both for final-acceptance gaging in the inspection or for production checking parts at the machine.

Hanson-Whitney Co., Hartford 2, Conn.

Vapor-Phase Inhibitor For Anti-Corrosion Packaging

A vapor-phase inhibitor is a chemical compound (usually dicyclohexlamine nitrate) which, in its vapor phase, inhibits, or prevents, the corrosive action of oxygen on metal which otherwise would occur in the presence of moisture.

The chemical known as VPI vaporizes extremely slowly and steadily over a long period; a minute amount of it dispersed in a coating on paper will give corrosive protection to an article sealed in such a package for many months. So potent is the vapor that only about 1 g is sufficient to saturate 16,000 cu ft of air.

Previous methods of corrosion-preventive packaging have sought to exclude either oxygen or moisture from the package with an accom-

PUMPS

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PUMPS

POSITIVE DISPLACEMENT AND IMPELLER TYPES

PUMPS

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FOR TWENTY YEARS—DEPENDABLE, ECONOMICAL, EFFICIENT

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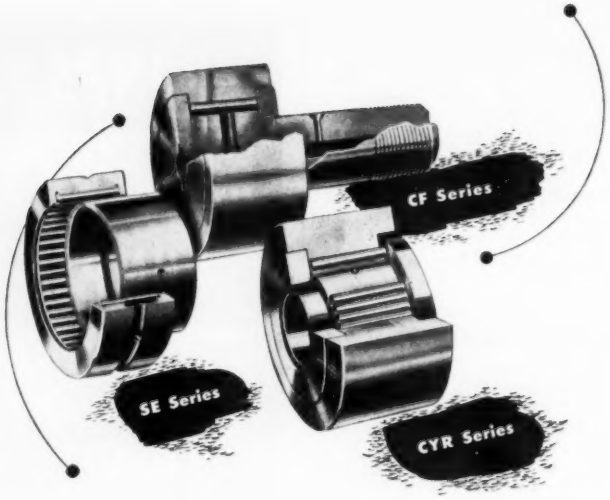
PIONEER PUMP & MANUFACTURING CO., INC.

STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

19651 JOHN R STREET
DETROIT 3, MICHIGAN

WRITE FOR CATALOG



MULTIROL *precision*
is ***PERMANENT***

The fine precision originally built into every McGill Multirol Bearing actually lasts longer. It can easily be considered permanent by comparison because Multirol Bearings are free from early internal wear that can destroy the accuracy of friction type bearings.

The rolling action of small diameter rollers maintaining a constantly lubricated roller line contact with raceways makes the difference — keeps the Multirol Bearing equipped machinery operating at top efficiency without costly maintenance for frequent adjustments and bearing replacement.

For the increased production demands just ahead you will need the performance extras of McGill Multirol Bearings. Adopt the SE Series for precision handling of increased loads when radial space is limited. Either the CF Series with stud or the CYR Series for shaft mounting will withstand heavy shock load in any kind of cam action application.

Write today for descriptive Multirol® Bearing Bulletins.

McGILL® precision bearings

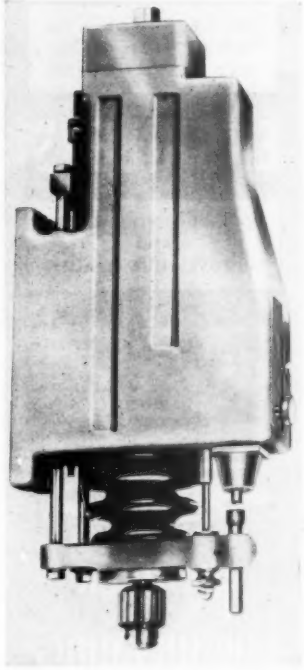
McGILL MANUFACTURING CO., INC., BEARING DIVISION
111 N. LAFAYETTE ST., VALPARAISO, INDIANA, U. S. A.

panying high cost of packaging due to applications of oil or grease coatings. VPI arrests the chemical action of corrosion and does not require the complete exclusion of either oxygen or moisture from the metal.

MIL-P-3420 Specification for Packaging Material, Corrosion Inhibiting, Volatile Type, has just been given formal Government approval.

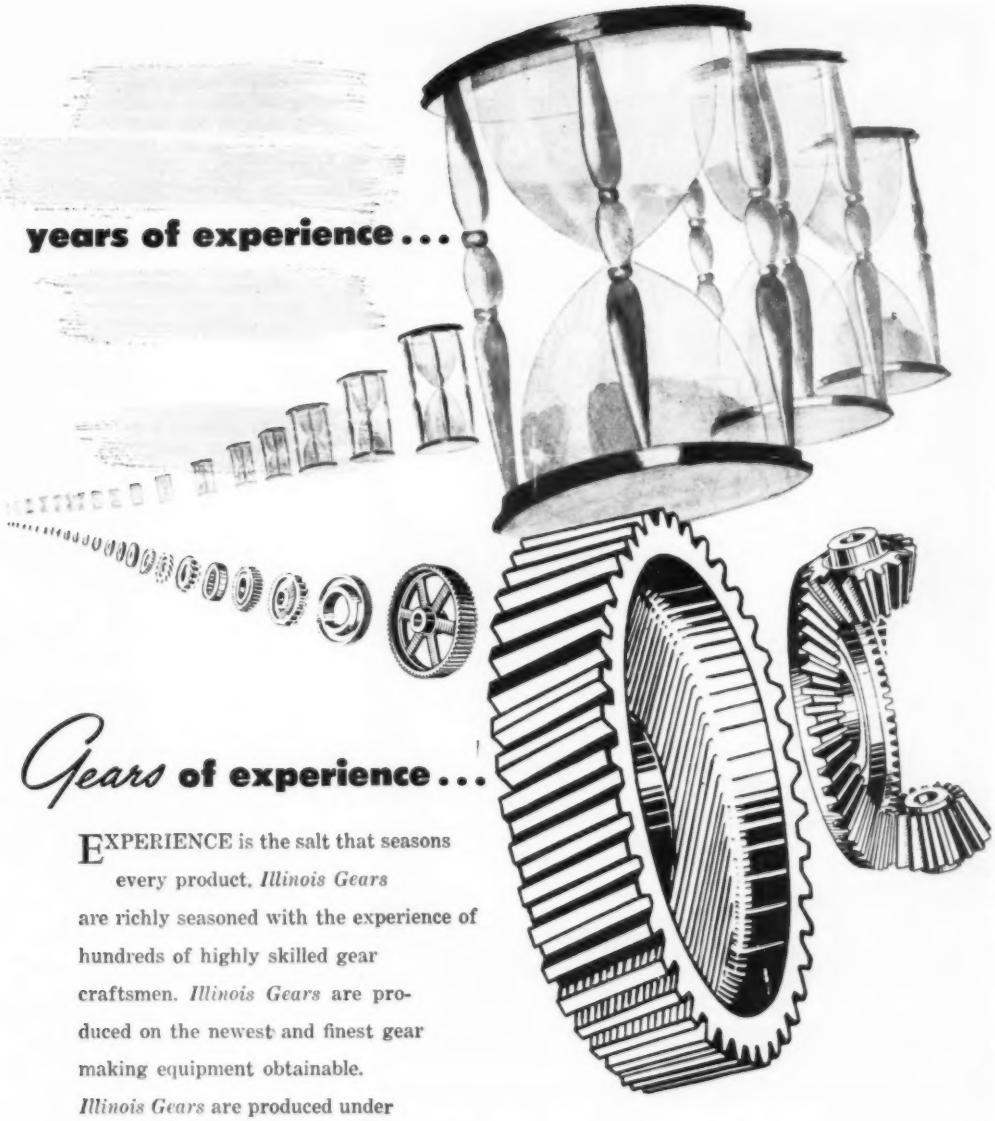
The wrap is available in various paper weights and the stock can be either flat or creped. The common basic weights are 30 and 60 lb. Various barrier wraps, which reduce the escape of the inhibitor and prolong the period of protection, are available. The barrier wraps usually consist of coated paper laminated and backed with other paper, foil, or plastic.

Angier Corp., Framingham, Mass.



Drilling and Tapping Units Are Completely Automatic

Two drilling and tapping units from Locke Gage Co. feature positive-control drilling and are automatically operated, eliminating the use of gears, brakes, or clutch. They have identical hydraulic-check mechanisms that permit control cycles and have built-in electrical solenoids that



years of experience . . .

Gears of experience . . .

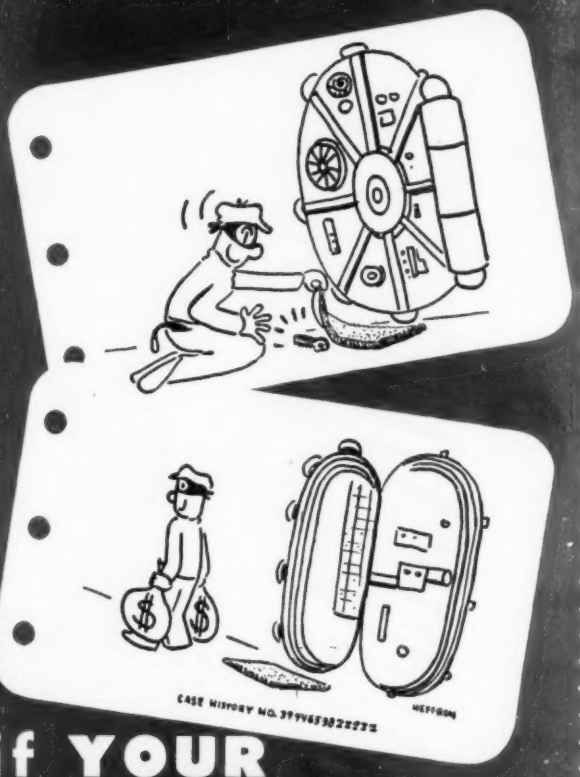
EXPERIENCE is the salt that seasons every product. *Illinois Gears* are richly seasoned with the experience of hundreds of highly skilled gear craftsmen. *Illinois Gears* are produced on the newest and finest gear making equipment obtainable. *Illinois Gears* are produced under experienced and competent supervision. For one gear or 10,000 gears, write, wire or phone:

Gears for Every Purpose

ILLINOIS GEAR & MACHINE COMPANY

3501 N. MATCHES AVE. • CHICAGO 34, ILLINOIS

INGENUITY
can solve any problem



if YOUR PROBLEM involves the higher production of threaded parts

HY-PRO TAPS

can help you to a solution

HY-PRO TOOL CO.
NEW BEDFORD, MASS., U.S.A.
Subsidiary of Continental Screw Co.

Order from your distributor or call the HY-PRO SALES ENGINEER

start drill unit action.

The heavy-duty model (4000 Series) uses a self-contained power source including a 2-cycle compressor which permits pressure adjustments from 0 to 500 lb. It is capable of drilling up to 5/16-in. dia in alloy steel or equivalent.

The light-duty model (4000 S-A series) employs shop air for power against a 3-sq in. piston surface. It can drill up to ¼-in. dia in mild steel or equivalent.

Positive-hydraulic control over throat on both models makes possible half-hole drilling and starting the drill on angular surfaces. Spindle travel is 3 in., of which any fraction may be used. The units can be mounted at any angle with hydraulic checks assuring a flow of oil from reservoir to restricting chamber.

Both units are enclosed in the same dimensional case (3¼ x 7⅝ x 18⅞ in. long) so that they can be used multiples.

Simple changes make them adaptable for tapping and burnishing operations. A deep-hole drilling attachment can be added for depths up to 3 in. The complete drill cycle is electrically controlled and can be set for any number of withdrawals which makes deep-hole work practical. *Locke Gage Co., 10232 Woodward Ave., Detroit 2, Mich.*

ROUND TABLE Discussion

TEA FOR TWO

I CAN'T SEE why Ed should scream his head off because his management is about to allow coffee to be served in his shop. I think it is a good idea.

This idea of varying types has been practiced for decades. I remember many years ago while I was working as a machinist in Boston that a widow with a large basket of fruit and candy was let into the shop every morning at 10 o'clock. When she left the basket was empty. The time lost in buying fruit and candy was more than made up for in higher efficiency. I think the same thing will happen if the men are allowed to drink a cup of coffee in the shop.

Ed's worry about the loss of 15 man-hours a day is much exaggerated. For a man that is satisfied with the conditions in his shop it is easy to save not only the 15 minutes, but

ATKINS

"Silver Steel"

BAND SAWS

for *Profitable* **Metal Cutting**

Atkins *"Silver Steel"* band saws, specifically designed for faster cutting and longer life, are expertly heat treated, accurately milled and quality controlled. Field Engineers, operating from our Research and Development Department, are available to solve your metal cutting problems. Simply request their services through an Atkins *"Silver Steel"* Distributor, who can serve you from stock with standard band saws covering every requirement.

E. C. ATKINS AND COMPANY

Home Office and Factory: 402 So. Illinois St., Indianapolis 9, Ind.
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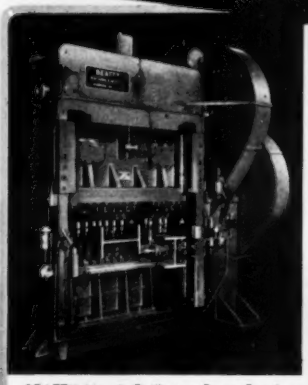
ATKINS

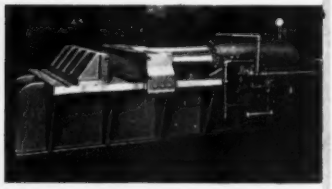
Use—Don't Abuse—Fine Tools!

Five *ANSWERS* looking for a *PROBLEM*

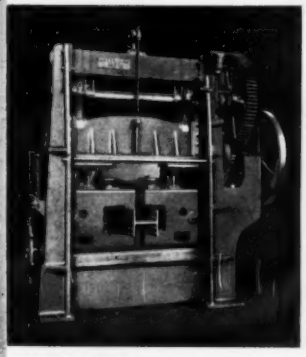


BEATTY No. 9 Guillotine Beam Punch for flange and web punching of beams up to 30".

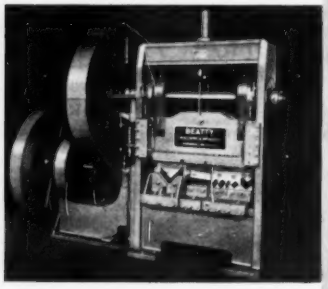
BEATTY Spacing Table handles flange and web punching of beams without roll adjustment.



BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.



BEATTY Adjustable Flange Punch Tools punch all 4 flanges of I-Beams and wide flange beams at one pass through.



BEATTY Guillotine Bar Shear for "short-order" shearing of flats, squares, rounds without changing tools.

BEATTY
Machine & Mfg. Co.
•
Hammond, Indiana

These five Beatty machines are speeding production, cutting costs in a lot of metal working plants. Perhaps one of these basic designs can be modified to meet your special needs. But if not there are more ideas where these came from. Let us know your problem and we will make a proposal. Our long and varied experience in machine design can be valuable to you.

perhaps one full hour a day. It is a very important thing to uphold the workers' good will toward their employer and encourage them to do their best. This can't be done by denying every bit of favor during working hours. On the contrary, if the employer runs his shop with the same kind of discipline as was used 10 years ago his shop is likely to be empty. Goose stepping is out of date, and the men have a right to be treated decently as techniques advance. Or are human beings going to be kept down on the same level as they were many years ago in spite of the advances made?

Management should always handle its men with some respect and common sense. Give the men a chance to buy coffee, candy and fruit a couple of times a day and they will work much better. It certainly makes for better employee relations, even if it is true that a few will take advantage of it and waste some time.

I agree with Al that it gives most of the men a lift, and the employer gains more than he loses. I don't think that Henry Ford would have distributed milk during working hours if he thought he would lose time in the factory by doing so.

The whole idea is not to give the me nomre leisure, but to handle them to the best advantage of the employer and still keep their confidence and good will.

A. E. Fristedt
Stockholm, Sweden

•

TURNABOUT

HAVING the prospective employee look over his possible boss may seem like madness to the old-line foreman. To his way of thinking, foremanship has indeed come to a sorry pass when a shop foreman has to have an interview with a man whom the personnel department interviews for a job. It's a pretty sad state of affairs when the job hunter wants to give the foreman a checkup before he comes to work, and refuses the job when permission is not granted to look over the foreman. However, to my way of thinking, the applicant had the right idea; there was a method to his madness.

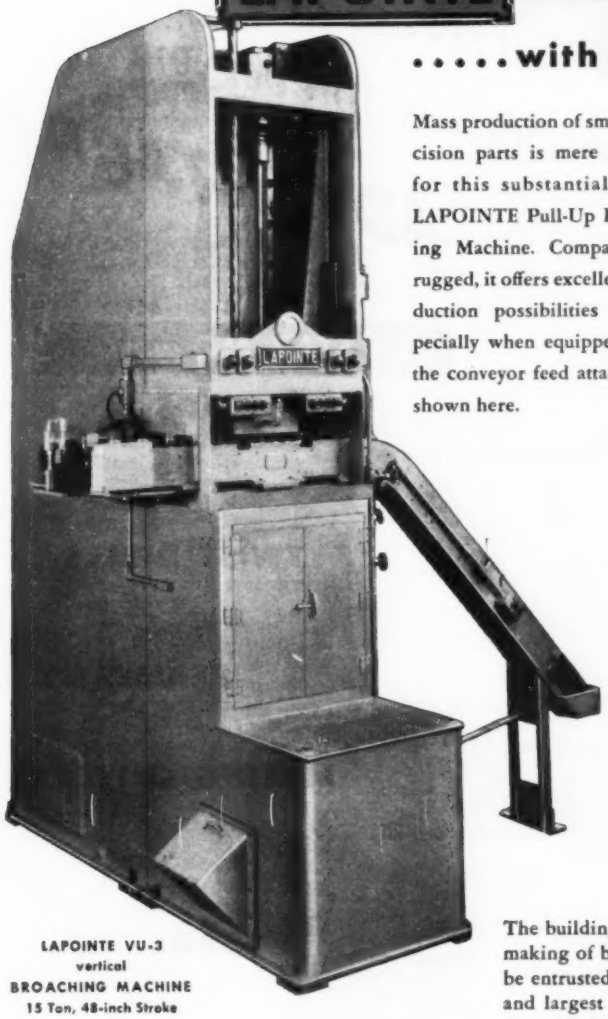
If the company wants to make sure that it is getting a good employee, why shouldn't the applicant for a job want to make sure the plant is a good place to work and the foreman a good man to work for, and with?

One of the best tests of a good foreman is the way he handles applicants

Here's a standard Vertical Pull-Up

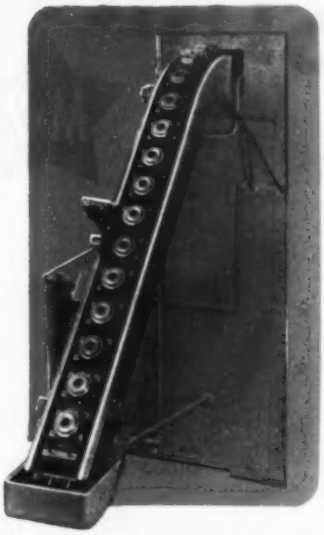
LAPOINTE BROACHING MACHINE

.....with possibilities!



LAPOINTE VU-3
vertical
BROACHING MACHINE
15 Ton, 48-inch Stroke

Mass production of small precision parts is mere routine for this substantial, *rigid* LAPOINTE Pull-Up Broaching Machine. Compact and rugged, it offers excellent production possibilities — especially when equipped with the conveyor feed attachment shown here.



For example: Rough broaching 61 teeth (special pitch, generated involute tooth form) in this 4-inch diameter steel forging **transmission gear blank,** is done at a speed of 200 parts per hour, at 80% efficiency.

The electrically driven transfer fixture is bent on a 45° angle to convenient loading height. This eliminates expensive pitting of machine. A spiral fixture, driven by a lead bar, drives the work by friction of shoulder. Fixture, machine and transfer conveyor are fully automatic. (The machine will not cycle if the broach is out of position.)

The building of broaching machines, the designing and making of broaches and special fixtures — all can safely be entrusted to LAPOINTE. Here in the world's oldest and largest broaching machine plant, you will find an accumulation of *engineering experience in broaching unequalled elsewhere.*

THE *Lapointe* MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

Firth Sterling

STAR·MO M-2

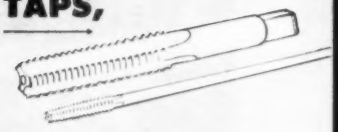
conserves critical materials to everyone's ADVANTAGE!

- ★ 29% Lower Base Price
- ★ 7% More Tools per Pound *(lower spec. grav.)*
- ★ Tougher than standard 18-4-1 Class B High Speed
- ★ Very good abrasion resistance
- ★ Lower Hardening Heats - - -

Lower power consumption
Reduced wear on salt bath equipment

Specify STAR-MO *(M-2)* for . . .

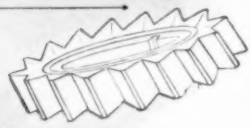
TAPS,



TWIST DRILLS,

REAMERS,

MILLING CUTTERS,



BROACHES,

THREAD CHASERS, LATHE and PLANER TOOLS

Star-Mo (M2) turns the necessary substitution requirements of NPA to *big advantages* for High Speed steel users.

Firth Sterling's Star-Mo (M2) is tougher than the standard 18-4-1 Class B High Speed when it is in the heat treated condition. Star-Mo (M2) also has an abrasion resisting quality approximately equal to the standard Class B 18-4-1 steel.

Write for Bulletin SL-2036

Firth Sterling

STEEL & CARBIDE CORPORATION
3113 Forbes Street, Pittsburgh 30, Pa.

Offices and Warehouses:* HARTFORD, NEW YORK*, PHILADELPHIA*, PITTSBURGH*, CLEVELAND, DAYTON*, DETROIT, CHICAGO, BIRMINGHAM*, LOS ANGELES.

B-243

for jobs. The traditional reception an old-line boss would give an applicant was to look him up and down, spit on the floor, and say, "Well, here's the job, let's see if you can handle it." Then he would keep a hawklike eye on the new man and seem to enjoy calling him on every mistake.

Today's foreman, in contrast, when the applicant for a job comes to him for interview, realizes that the man is going through a testing period himself; trying to adjust his thinking and questions. He does not want to ask the foreman too many questions for fear of appearing stupid. Yet he wants to find out the necessary information about the job, the man who will be his boss, and the environment of the job. The foreman, if he is wise, will give the man a friendly welcome, guide him around the department, explain what his job will cover, and make him feel at home. In this manner both foreman and applicant will get a chance to obtain information.

In most plants, the personnel department is concerned with the problems of selecting personnel and placing them on the job. It is the job of this department to find the help, trained and experienced in the skills needed. It works under policies determined by management and interprets these policies to the applicants it hires. The personnel department realizes that hiring the applicant also involves the problem of how well he will suit the foreman and whether the foreman will suit the worker. Most personnel men believe it is only right that the worker be granted the privilege of having a preliminary interview with the man he is going to work for before the employment transaction is consummated. There is nothing harmful in the practice of the worker interviewing the foreman. The man is looking for a job in which he will have to spend most of his waking hours with the foreman, so why shouldn't he be permitted to check on the type of man from whom he will have to take orders? The foreman doesn't hesitate in having the personnel department check up on a worker who applies for a job, so why shouldn't the worker be permitted to do a little checking up himself? It works both ways. A double check benefits both the company and the applicant. It the man finds out in advance that he will not be able to get along with his prospective foreman, and turns down the job, nobody is the loser.

Employment specialists claim that the idea of a preliminary interview with the applicant's prospective supervisor is a must in efficient hir-

NEW FOLLOW-THROUGH TYPE
Ideal for stacked material or cutting through partitions
40 SIZES from ⅝" to 4½"
You can cut
ANY MACHINABLE MATERIAL
from wood to hard steel with these rugged, gang-cutting hole saws
DRIVE with any portable power tool, radial drill, lathe or drill press with ½" or larger chuck
"Blu-Mol" Hole Saws are part of the world's broadest and most highly developed line of metalcutting saws
Cut up to 1⅛" DEPTH in solid material
Unbreakable HIGH SPEED Welded Edge

Cut big holes faster and cheaper with new, high-speed

BLU-MOL®

HOLE SAWS

Every day industry is finding new applications for these remarkable saws. Wherever large diameter holes — anywhere from ⅝" to 4½"—have to be cut, chances are a "Blu-Mol" Hole Saw will do the job for you quicker and cheaper. Cuts may be taken up to 1⅛" deep in solid stock — to almost any depth desired in stacks of sheet metal or other material, or when cutting through partitions or floors. Try "Blu-Mol" Hole Saws. On many applications they more than pay for themselves in the time they save the very first time they're used.

WRITE FOR FULL DETAILS

— or let us arrange for a demonstration. See for yourself how these new, high-speed "Blu-Mol" Hole Saws can save you time and money on hundreds of maintenance and production operations.

MILLERS FALLS CO.
Greenfield, Mass.

MILLERS FALLS TOOLS
SINCE 1868

The Mark of Superiority

Slashes handling time!

Work-handling consumes far more time than work-cutting in producing many jobs. To reduce manual effort by one-half increases production far more than by faster cutting speeds. To make this improvement without burdening the operator—in fact to make it easier for him—is the chief advantage of the new Sibley Model ME-25.

The variable speed drive, the big 25" swing, the extra large table, the convenient speed controls, the handy tachometers, all combine to make this 1" capacity, medium weight machine a production advantage in any shop!

SIBLEY
MACHINE & FOUNDRY CORP.
28 EAST TUTT STREET
SOUTH BEND 23, INDIANA

SIBLEY MACHINE & FOUNDRY CORP.
28 E. Tutt St., South Bend 23, Indiana
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Company _____
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City _____ State _____

ing procedure. After all, aptitude tests, and psychological hiring devices help determine whether the applicant has the mental fitness and aptitude for the job. But only the worker in an interview with the foreman can determine whether personality conflict will raise its ugly head. The employment manager does not have a simple job. It is a difficult one, requiring skill, experience, training, endless patience, and excellent judgment if he is to assemble and put to work a high-caliber organization of workers.

It is trite to say that the employment manager must know human nature. Through his knowledge of the personality of the various supervisors, he is in a good position to determine whether or not an applicant will fit into the particular group headed by that supervisor. But the final interview with the applicant's prospective boss should carry as much weight as the preliminary interview in the employment office. In fact, it is believed that the new worker's interview with his prospective boss is more important than psychological testing in the employment office. The employment manager through his knowledge of job requirements and the ability required in many different types of work can endeavor to fill the jobs adequately. He knows which jobs are tedious, repetitive; which jobs require physical strength, dexterity, good vision. He will not, if he knows his business, send a quick-witted, high-strung, nervous, sensitive, alert worker to a job requiring nothing more than the ability to follow instructions and to do the same thing over and over again. He tries to fit,

"Oh, him? He's just our foreman — but he never gives me any static!"

Drilling Problem?

Black & Decker's Drill Line is a good bet to solve it!

Completeness of Line, Quality Construction Pay Off for Users!

FOR drills to fit your needs—for top performance on any portable drilling job—it pays to check Black & Decker *first!* That's because Black & Decker gives you an unmatched choice of Drill models. Capacities from ¼" to 1¼"—choice of handle arrangement for easiest operation—choice of speed, power and price in most capacities. And it's also because Black & Decker Drills give you powerful B&D-built motors—full ball-bearing construction—extra-tough gears, shafts and chuck spindles—husky housings, streamlined design, perfect balance.

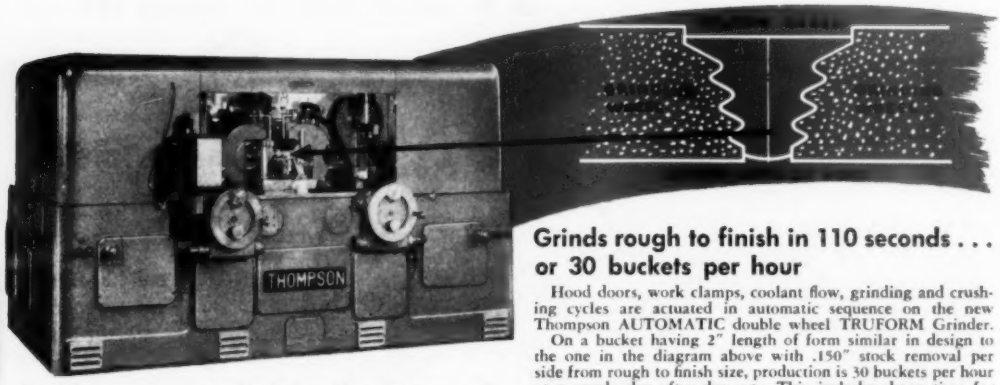
Whether your problem is in production, maintenance or construction—whether it requires large or small drills—see your nearby B&D Distributor *first* for expert help. And write today for free, detailed catalog to: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Maryland.

B&D Black & Decker PORTABLE ELECTRIC TOOLS

WORLD'S LARGEST, MOST COMPLETE LINE

New Thompson AUTOMATIC double wheel TRUFORM Grinder speeds jet engine production

GRINDS BOTH SIDES OF JET TURBINE BUCKETS OR BLADES SIMULTANEOUSLY IN A SINGLE SETTING

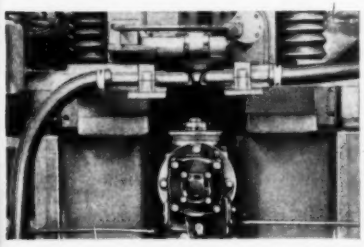


To grind root sections on gas turbine buckets with greatest accuracy and productivity, Thompson developed this new AUTOMATIC double wheel TRUFORMING machine featuring simultaneous grinding of both sides of root section with one setting of work.

Grinds rough to finish in 110 seconds . . . or 30 buckets per hour

Hood doors, work clamps, coolant flow, grinding and crushing cycles are actuated in automatic sequence on the new Thompson AUTOMATIC double wheel TRUFORM Grinder.

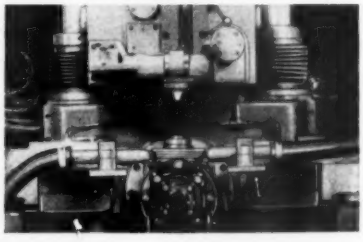
On a bucket having 2" length of form similar in design to the one in the diagram above with .150" stock removal per side from rough to finish size, production is 30 buckets per hour at a steady day after day rate. This includes down time for dressing, regrinding the crusher roll, initial machine warm up period, wheel changing and diamond changing. Actual machine time from rough forging or casting to finish is 104 seconds plus 6 seconds for loading and unloading time . . . makes total time floor to floor 110 seconds per piece.



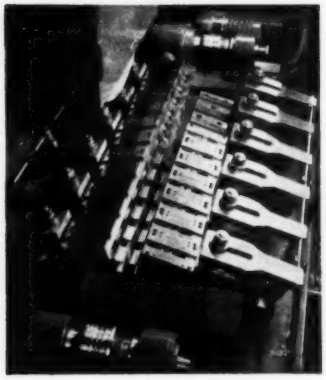
FOR ABSOLUTE SYMMETRY BOTH WHEELS ARE DRESSED FROM A SINGLE CRUSHER ROLL

GRINDING POSITION

CRUSHING POSITION

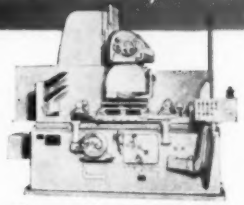


Standard THOMPSON TRUFORM Machines also grind jet buckets faster, better



By means of multiple grinding of jet turbine buckets the standard TRUFORM Grinders still offer high production plus many advantages such as flexibility of standard machine design and lower first cost. Although compared to the new AUTOMATIC the standard TRUFORM requires more skillful set up and tooling.

Typical tooling on Type "C" TRUFORM producing 24 buckets per hour. Type "B" TRUFORM produces 18 parts per hour.



Thompson Type "C" TRUFORM

FOR COMPLETE DETAILS WRITE TODAY

The Thompson Grinder Co.
Springfield, Ohio

Thompson SURFACE Grinders

Combined operations save money

Automatic drilling and tapping machines increase output per man-hour, reduce handling, make parts uniform and accurate

Dear Sir:

The man and the machine cost 2-2/10¢ for 7 operations on each drive housing. That makes the average cost per operation about 1/3¢.

The man and the machine cost 1-8/10¢ for 19 operations on each typewriter part. That makes the average cost per operation about 1/10¢.

Cost basis is conservative

For both costs we made these 3 assumptions: 1) The man would receive a generous hourly wage. 2) The machine would operate at 80% efficiency. 3) The entire investment for machine and tooling would be amortized over the first 6000 hours of operation, a fraction of the profitable life. No power or overhead.

Why costs are low

The main reason: One machine with one operator performs many operations per hour. (In these cases: 1820 operations per hour on the drive housings; 3344 operations per hour on the typewriter parts, both based on 80% efficiency.)

Other reasons:

You have less handling because of fewer chuckings.

You reject few parts because —

Operations are in exact relationship. (In the same chucking of the typewriter part, 19 holes are drilled.)

Operations are in exact location. (For the drive housing, bushings in piloted plates guide every tool except the tap.)

Machining is uniform. (Units with automatic cycles and cam feeds perform every operation.)

We tool each machine and run off samples for your approval before we ship the machine. Every part will be exactly like the samples, assuming (naturally) that you maintain the machine and tools properly.

How much can you save?

To learn *your* savings, ask us for proposals. Ask others, too. Since this is our sole business, our proposals should certainly compare favorably with others. (We do, however, remember one man who thought all competitive proposals for one job looked equally good. We finally got the order on the basis of our Dun and Bradstreet rating. That is one way to decide.)

If you want a proposal, just send our Mr. L. A. Carll a print of a high production part with drilling and analogous operations. Tell him the operations and hourly output you need. Or ask him for free bulletins that show 40 setups. so

Sincerely,
Kingsbury Machine Tool Corp.
40 Laurel St., Keene, N. H.

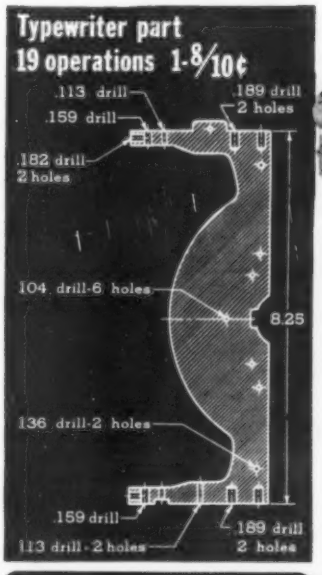
325 PARTS AN HOUR GROSS. This automatic indexing machine performs 7 operations progressively on the governor hole.

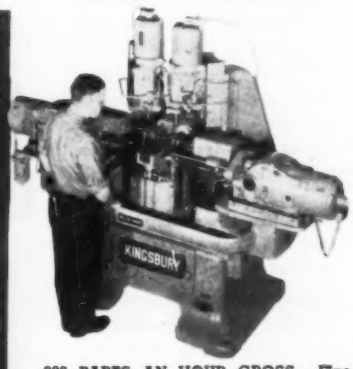
- Each automatic unit is horizontal and operates one tool. There are 3 combination tools — 2 combination drills and countersinks and one tool that spot faces both walls.

- Bushings guide every tool except the tap.

Ball bearing bushings guide the combination 1.078 drill and countersink, the 1.109 reamer and the combination spot face.

The combination .359 drill and countersink and the .375 reamer pilot into the large hole. Other bushing carriers pilot onto the fixtures.





220 PARTS AN HOUR GROSS. Five units operate 19 drills on the part from 4 directions in one chucking. There is no indexing.

- The 2 horns point upwardly. Two vertical units drill the .182 holes.
- Horizontal units at left and right have multi-spindle auxiliary heads to drill the holes on the end of each part.
- The horizontal unit at the rear has an 8-spindle auxiliary head to drill six .104 holes and two .136 holes.
- Here is the cycle (about 16 secs.):

1. The man loads the fixture and trips a lever.
2. The horizontal units operate and then trip the vertical units.
3. The vertical units operate. (In that way vertical drills do not clash with horizontal drills.)
4. The man unloads the fixture.

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

ONLY

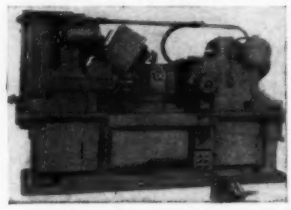
GOSS and DeLEEUW AUTOMATIC CHUCKERS

offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.



The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DeLEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

as far as available human material allows it, the worker to the foreman.

Given two workers of equal skill, one will get along well with a certain foreman, another will fail miserably when directed by the same foreman. He must have a realistic approach to every job requirement and not expect foremen and department managers to fit round pegs into square holes. He must sort out, weed out, select, reject, while working with the greatest variables on earth: human nature, and human ability. But the final decision of the employment manager should take into account the interview between the foreman and the worker. Through a double check interview, each can size up the other's personality and decide if cooperation can be maintained.

A pre-employment interview between foreman and prospective employee will prove that "the cautious seldom err." The trend of the interview will determine the reaction of both participants to each other. The foreman can, during the interview, through questions and observations, get the low-down on the applicant's traits, appearance, manners, emotional stability as far as his behavior indicates it, attitude toward work, willingness to cooperate, likeableness, and sincerity. These may be detected through the applicant's actions in the foreman's presence, his conversation and responses to questions, and information on his application previously furnished to the personnel department on his initial interview. A person is a composite of many traits. The foreman should not let one trait overshadow his judgment of the others. The prospective employee, on the other

"It's a new type counter . . . my wife can tell how many I hoist."

IF YOU WANT THE ANSWER... TO ALUMINUM EXTRUSIONS!

You'll find it in this *NEW* W-S Bulletin 340-A, just coming off press. Write for your copy . . . Today!

This booklet not only illustrates the complete-line of W-S Extrusion Presses, including capacities, but, it also shows how production can be improved . . . increased. You can produce the extrusions you want —when you want them, at greatly reduced cost, and in these days of material shortages you won't have to carry expensive slow moving inventory.

Read about the *fast die-change* which permits one-man set-up and die-change. Read about the—Remote —push button automatic cycle controls featuring faster cycles of production—it gives you continuous operation without costly cycle delays.

This booklet shows you how others are extruding light metals and non-ferrous shapes—fast—profitably. It tells you why each and every individual W-S Machine is a complete "packaged" extrusion plant. Write for your copy . . . today, to Watson-Stillman, the "Headquarters" for Extrusion Presses.

HYDRAULIC MACHINERY DIVISION **WATSON-STILLMAN** ESTABLISHED 1848

Factory and Main Office: 163 Aldene Rd., Roselle, New Jersey

Branch Office: 228 N. LaSalle, Chicago, Ill. • Manufactured in Canada by—Canadian-Vickers, Ltd., Montreal

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San Francisco 7, Cal...Schaffenbush Mach. Tool Co.
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W-S "COMPLETELINE" HYDRAULICS . . . THE SHORTEST DISTANCE FROM PRODUCTION TO PROFITS

Be Sharp—
KEEP YOUR PLANT'S TOOLS SHARP

With
OLIVER ACE
Universal Tool and Cutter Grinders

OLIVER OF ADRIAN

You'll find no problems in keeping difficult cutters sharp if you equip your toolroom with OLIVER ACE Universal Tool and Cutter Grinders. They excel on high speed and Tungsten-Carbide work and easily grind cutters of all types. Proven and dependable, OLIVER ACES give guaranteed accuracy—they're designed and built for it.

OLIVER Grinders reduce fatigue. Their direct reading for clearances eases the operator's job (no stoop . . . no squat . . . no squint). Faster on most grinding operations, the ACE is easy to operate—simple to set-up. BE WISE, OLIVERize.

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing.

2 MODELS: Standard and Heavy Duty (illustrated).
Write For Illustrated ACE Catalog

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1414 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

hand, should attempt during the course of the interview to size up the type of man his prospective supervisor appears to be. He should ask the foreman questions about the type of job and department in which he will work and the physical demands of the job. He should try to get the foreman to tell him about the training required and the prospects for advancement.

The applicant, if he is intelligent and alert can form a fairly good estimate of the kind of person he will have to take orders from and work with. He's playing it safe by this turnabout interview with the foreman. He knows "it's better to be safe than sorry."

Harry Kaufman
Philadelphia, Pa.

•

IN THE CHANGED industrial conditions of today, it is highly desirable that the prospective foreman *should* have an opportunity to see and talk with the prospective worker, an interview with the personnel people, only, would be a job half done. Apart altogether from Ed's dislike of being "interviewed" by a job seeker, no personnel officer should actually engage a man without the foreman concerned having a say in the transaction. If the personnel officer's duties are to benefit the company they must not even appear to infringe on the foreman's status or dignity. They must not convey, even remotely, the impression that a responsible foreman may not be trusted to hire his own labor, if the personnel engages labor without reference to the foreman concerned, that is the impression which will register on the foreman's mind and then good bye to any form of co-operation between those two executives.

Intelligent work planning and progress are indispensable to modern production and a personnel section can be more than merely useful but none of them can be rated above a level headed, experienced shop foreman. In the final analysis it is the shop foreman's responsibility to see the finished product out at the door. In many respects, he is the corner stone of the industrial edifice.

It thus follows that nothing derogatory to the dignity of the holder of such an office should be permitted within the organization. If the foreman is held to be responsible for the execution of the work, it is reasonable that he should have the last word in the selection of the men who are to carry out his instructions. The function of the personnel people should be that of seeking likely help,

This thickness control screw, made from STRESSPROOF steel bars, is a vital part of the asphalt road layer shown laying an air strip at a Pacific base.

COSTS DOWN 25%
PRODUCTION UP 100%

WHEN STRESSPROOF® REPLACED HEAT-TREATED .40 CARBON ALLOY STEEL BARS

- *Speeded Machining 50% to 100%*
- *Eliminated need for Heat Treated Alloy Bars*

In this asphalt road layer, instead of using a heat-treated, hot-rolled .40 carbon alloy bar, STRESSPROOF was specified. STRESSPROOF provided *in-the-bar* the necessary strength and wear resistance, and machined so much easier that production time was cut in half.

STRESSPROOF's unique combination of four important qualities *in-the-bar* is cutting costs and speeding production on many similar defense jobs. STRESSPROOF is twice as strong as ordinary cold-finished bars. Its resistance to wear often makes carburizing unnecessary. It is stress-relieved to minimize distortion, and has *in-the-bar* machinability fully 50% better than heat-treated alloys of the same hardness. Yet STRESSPROOF is less expensive than all cold-finished and most hot-rolled alloy steel bars that have been fully heat treated.

STRESSPROOF is also available with a Ground and Polished finish.

LASALLE STEEL CO.
1416 150th Street, Hammond, Indiana
Manufacturers of the Most Complete Line of Cold-Finished and Ground and Polished Bars in America

La Salle
STRESSPROOF®
SEVERELY COLD-WORKED, FURNACE-TREATED CARBON STEEL BARS

STRESSPROOF IS PLAYING A VITAL ROLE IN NATIONAL DEFENSE!

A very large proportion of STRESSPROOF production, today, is going into defense jobs. However, from time to time sample bars may be available for testing purposes.

Why Do More Than 100 Leading Firms Use Sentry HARDENING METHODS?

Sentry protects pre-cut keenness of teeth on Nicholson's high speed rotary power tools!

Versatility . . . Sentry Heat Treating Methods are used daily at Nicholson on an almost endless variety of tools.

ASK FOR CATALOG F-2

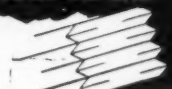
REASON Keenness of Teeth Maintained

The Nicholson File Company in Providence, R. I., tell us that the SENTRY DIAMOND BLOCK METHOD of heat treating their high speed rotary power tools (hand cut or precision ground) permits them to do a top quality job and to fully maintain pre-cut keenness of teeth. Further, SENTRY gives Nicholson the right heat treating answers on an almost endless variety of sizes and shapes of rotary power tools.

The Sentry Company
INDUSTRIAL ELECTRIC FURNACES AND EQUIPMENT FOR HEAT TREATMENT OF METALS
"Always on Duty" FOXBORO, MASSACHUSETTS
DIAMOND

25,000 THREADED PARTS PER HOUR

with PLANETARY THREAD ROLLING



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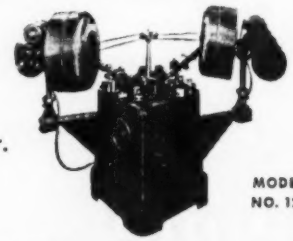
A proven automatic production machine that outmodes all former types

Die life, 5,000,000 pcs.
Accuracy, class 3
Capacity, 1/4" x 2"
Fetter Nails, 36,000 per hr.
Set-up time 45 minutes



MODEL NO. 125

TAPMASTER
High Production Tapping Machine
Range 3/8" to 4"
Send blueprints for production data

Write for descriptive bulletin today

D. H. Prutton MACHINERY CO.
5297 WEST 130th ST. CLEVELAND 11, OHIO

getting a reliable record of their experience, activities, general character and habits. If their training in psychology can uncover facts which the average foreman may be unable to unearth, such facts should be clearly set forth on each man's record but when this preliminary work is complete such records should be placed before the foreman concerned, to guide him in his choice, but *only* to guide him.

If he is a responsible, experienced foreman he will find little difficulty in sizing up his man, in this task he should be helped by the information furnished by the personnel dept. If this procedure is adhered to, Ed's grouse falls to the ground, since while he is interviewing the men they will, naturally, be sizing him up. This is all to the good and might spare Ed the annoying experience of having a man for a few days or weeks only, when he might decide to move on if Ed's methods and attitude did not meet with his approval. That is a situation which could easily arise, in those times of full employment.

Ed and foreman of his generation cannot afford to remain static in the matter of outlook on industrial relationships. If they wish to retain their status and job-worthiness they must raise their sights and aim at adjusting their outlook to what modern conditions demand of leadership. Gone forever, one hopes, are the days when foremen had a pool of unemployed skilled men to draw on when a vacancy had to be filled; that was a wasteful and unhealthy state for any industrial country to be in and with its passing, new conditions and responsibilities confront those of us responsible for the executive side of manufacturing policy.

If labor can be convinced that it is getting a fair share of the fruits of its toil we might then reach a degree of co-operation and accommodation hitherto undreamt of.

C. D. Mackinnon
Lanarkshire, Scotland

•

THE IDEA of a worker wanting to check on the boss is quite upsetting to some of the old-time foremen. However, if they would only think back to the interviewing they did before the days of Personnel Departments and recall the men who refused to go to work because of a clash of personalities during the interviews, this desire to look over the boss would not be too alarming to the foremen.

Every individual working for a

(Continued on page 228)

GMC, Ford, Harvester Rack Up Contract Gains Over World War II

NEW YORK—General Motors Corporation, with more than $3½ billion in prime war orders, continues to lead the list of American companies with government contracts.

This sum, the National Industrial Conference board reports, is about one-fourth of the dollar value of war goods GMC produced in World War II but it represents nearly twice as large a slice of all government contracts as the company received last time. GM's share is now 14.7%, as compared with 7.9% in June, 1940 to Sept. 1944.

In an analysis of defense contract allocations, the NICB found that the predominance of orders for aircraft and heavy ordnance in the present situation is resulting in a different geographic and company distribution of contracts from that of World War II. The biggest factor is lack of shipbuilding; shipping needs being met by activating the "mothballed" fleet.

• Tanks, planes, projectiles, jet engines; not generally made by GM for military use; constitute 55% of its current defense orders. Another 35% is made up of military items similar to those in production before the Korean crisis. The remaining 10% is for trucks, electric equipment, and other products similar to those made for civilian use.

Ford Motor Company ranks second to GM in war orders, its prime contracts totalling a billion dollars. Of the 10 companies following Ford, nine rank higher now than they did in World War II. The widest jumps were made by International Harvester, 33rd last time and in 11th place now; Republic Aviation up from 24th to sixth, and Boeing advanced from 12th to third.

• Aircraft companies have made the biggest gains; about one out of three companies on the current 50 largest list manufactures airplanes.

The board said small firms are participating in defense work at an increasing rate. They are receiving orders both directly from the government and through subcontracting.

Universal Joint Division To Make Tank Parts

MEMPHIS, Tenn.—The Mechanics Universal Joint Div., Borg-Warner Corp., has been awarded over $2 million in prime and subcontracts for the manufacture of parts for light and medium tanks.

The tank parts will be made in a new plant already under construction adjacent to the present Memphis plant.

The contracts include orders and releases from Ford Motor Co., American Locomotive, Chrysler Corp., Fisher Body Div., GMC, Allis-Chalmers Mfg. Co., American Car & Foundry Co., Food Machinery Corp., Detroit Arsenal, Cadillac Motor Car Div., GMC, International Harvester Co., Pacific Car & Foundry Co., and Massey Harris Co.

American Welding Expands To Produce Engine Parts

WARREN, Ohio—American Welding & Mfg. Co. has received $3 million in new orders for such items as turbine casings, coated-nozzle boxes, exhaust cones and many stainless steel and titanium welded ring applications, adding to the company's backlog of jet and reciprocating aircraft engine parts.

The company has announced plans for additions to plant and equipment to cost in excess of $5 million, permitting a substantial increase in output of parts. Purchase of new equipment for the expanded facilities will be aided to the extent of $4,160,000 by a Government facilities contract.

Directory Of Defense Agencies Available From Chicago C of C

CHICAGO—The Chicago Association of Commerce and Industry has published a revised "Directory of Federal Government Defense Agencies in Chicago and Washington." This aid to business men is distributed to the Association membership and to other business men upon request.

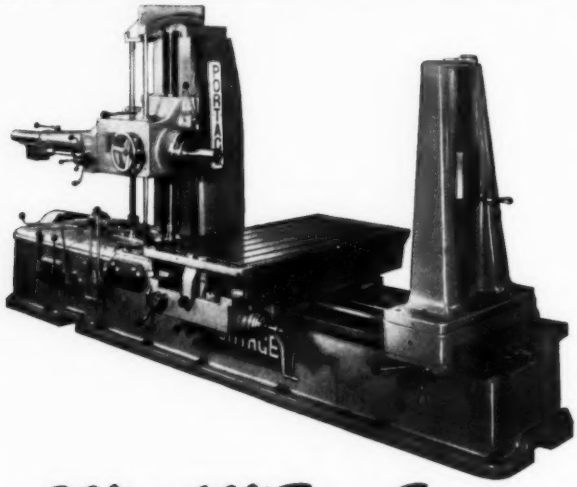
The directory lists 48 offices of 35 different defense agencies, including names, titles, addresses and telephone numbers of principal officials.

The directory is periodically reissued in order to keep abreast of changes in agencies and in their personnel. The address is: 1 North LaSalle St., Chicago, Ill.

Hulls for the Grumman Albatross amphibious air-rescue plane are shown being assembled at Evansville, Ind. plant, Plymouth Div., Chrysler Corp. About 40% of the plant's floor space has been allocated for the defense work

Quicker Tool Change WITH PORTAGE

HORIZONTAL BORING, MILLING AND DRILLING MACHINE — No. 4



20% to 40% Time Saving

PORTAGE has long been known as a better built horizontal boring mill. It has no large cored walls under the column, to invite deflection. Its heavy reinforced one-piece base is engineered to give the entire machine greater rigidity.

The quick tool change feature is equally important. For it's the floor-to-floor time that counts. Users of PORTAGE machines report from 20% to 40% time saving.

Large easy reading dials, graduated in thousandths of an inch, provide for hand adjustment. All controls in front. Power rapid traverse available on any unit with feeds. Working surface 36" x 72" and 60" cross travel. For precision work at maximum speed and quicker tool change, it's the PORTAGE. In writing for catalog, feel free to explain the nature of your work.

THE PORTAGE MACHINE COMPANY
1026 SWEITZER AVENUE *(Established in 1916)* **AKRON, OHIO**
DEALERS IN ALL PRINCIPAL CITIES

Canadian Manufacturers Get Defense Contracts

The following Canadian firms have been awarded contracts under Canada's defense program, according to the *Financial Post*:

Abercorn Aero Ltd., Montreal—dinghies, life rafts, and aircraft spares, $318,125.

Aviation Electric, Ltd., Montreal—aircraft instruments and spares, $101,571.

Canadian Car & Foundry Co., Montreal—aircraft reconditioning, $660,000.

Bickle-Seagrave Ltd., Woodstock, Ont.—fire trucks, $122,435.

Canadian Wright Ltd., Montreal—aircraft engine repair, $215,000.

Chrysler Corp. of Canada, Windsor, Ont.—automotive equip., $102,927, $419,282.

Ford Motor Co., Windsor, Ont.—automotive equipment, $241,668, $653,679.

MacDonald Bros. Aircraft, Winnipeg, Manitoba—aircraft reconditioning, $1,560,717.

Marine Industries Ltd., Montreal—turbo generators, $104,000.

Northwest Industries Ltd., Edmonton, Alberta—preservation of aircraft engines, $150,000.

Rolls-Royce Montreal Ltd., Dorval Que.—aircraft engine spare parts, $165,196.

Aircraft Industries of Canada Ltd., St. Johns, Que.—aircraft parts, $220,000.

Allis-Chalmers Rumely Ltd., Toronto—industrial equipment, $165,438.

Armco Drainage & Metal Products of Canada, Ltd., Guelph, Ont.—prefabricated buildings, $1,199,139.

Canadair Ltd., Montreal—aircraft repair, $1,547,000.

Canadian Vickers, Ltd., Montreal—refitting, minesweeper, $475,000.

Contractors Machinery & Equipment Ltd., Hamilton, Ont.—industrial equipment, $223,978.

George T. Davie & Sons Ltd., Lauzon, Que.—refitting minesweep's, $1,425,000.

DeHavilland Aircraft of Canada Ltd., Toronto—aircraft parts and repairs, $879,074.

Electronic Materiels International Ltd., Ottawa—electronic equipment, $321,898.

General Motors of Canada, Ltd., Oshawa, Ont.—automotive equipment, $1,173,489.

Northern Electric Co., Ottawa—electrical equipment, $129,340.

Northwest Industries Ltd., Edmonton, Alberta—aircraft repair, $1,692,000.

Pictou Foundry & Machine Co., Pictou, N. S.—refitting, minesweeper, $950,045.

Western Flyer Coach Ltd., Winnipeg, Manitoba—automotive equipment, $680,000.

Willard Storage Battery Co., Toronto—storage batteries, $199,172.

PLANT FACILITIES OPEN TIME AVAILABLE on INTERNAL *and* EXTERNAL THREAD GRINDING

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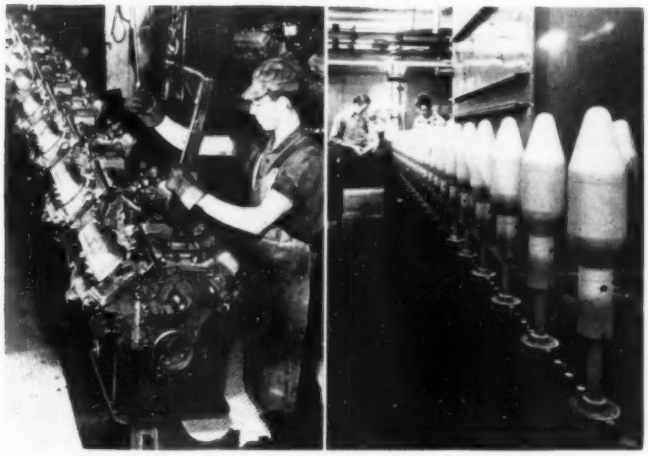
MACHINERY BUILDERS, INC.
475 GRAND CONCOURSE
BRONX, NEW YORK



3.5-in. rockets and high-compression Rocket engines being assembled in two assembly plants at Lansing, Mich., in Oldsmobile's program of combined operations. Rockets are one phase of Oldsmobile's defense work which also includes 90-mm tank guns and rotating parts for Curtiss-Wright's J-65 Sapphire jet aircraft engine

Jet Cargo Helicopter To Be Built By McDonnell

ST. LOUIS, Mo.—A Navy contract to build a jet-powered cargo unloader helicopter has been awarded to McDonnell Aircraft Corp. Using a single, three-bladed rotor driven by small jet engines on the blade tips, the carrier-based helicopter will be capable of transfering heavy equipment to other ships or to combat units under all weather conditions.

Subcontractor Exhibit

DETROIT—To enable small businessmen to examine military items which they might make under subcontract, an exhibit is being organized by the Armed Forces Regional Council, Oct. 30 to Nov. 2 at the Michigan State Fair Grounds in Detroit. Other exhibits are being planned.

Plants Expand for Defense

• **AC Spark Plug Div.** of General Motors will expand its Dort Highway plant to increase manufacturing floor space by 50%. The new building will be used for manufacture of special defense products, including the recently announced fire control systems for Skysweepers.

• **Aluminum Co. of America** will begin construction this month on its new aluminum smelting plant at Rockdale (Milam County) Texas. Metal-producing facilities will be in partial operation late in 1952. Aluminum production capacity of the plant will be approximately 170 million lb annually.

• **Charles H. Besly & Co.,** Chicago, is building a modern one-story plant in South Beloit, Wis., which is expected to increase production of machine and cutting tools approximately 100%. Useful floor area will be increased by 20% over the present plant.

• **Laurens Bros., Inc.,** Cincinnati, dealers and rebuilders of machine tools, has completed a 12,000-sq ft addition to its Highland Ave. plant, doubling the former size.

• **Lincoln Electric Co.** has moved into its new modern plant headquarters at 22801 St. Clair Ave., Cleveland. The move was made without losing any more than 10% of production for the month during which the complete move was made.

• **Cincinnati Milling Machine Co.** formerly dedicated its new Wilmington, Ohio, plant on Sept. 15. The plant has been in partial operation for two months in the manufacture of milling and grinding machines. It contains 110,000 sq ft of manufacturing space and 20,000 sq ft of office space.

• **Mechaneers, Inc.,** Bridgeport, Conn., is planning a large expansion and modernization program of facilities in the Bridegeport area. The firm specializes in designing and production engineering for aircraft.

• **Glenn L. Martin Co.,** Baltimore, Md., has purchased a 7000-ton hydraulic press in suport of its program for expansion of production facilities. The press is to be used for low pressure, shallow, metal forming by the Guerin process. Production space at the Martin plant is to be increased by 1,550,000 sq ft and storage area by more than 220,000 sq ft.

• **Pratt & Whitney Aircraft,** East Hartford, Conn., has leased 70,000 sq ft of floor space in the Manufacturers Foundry Co. building at Waterbury, Conn., to be used as a receiving center and transfer point for new machine tools that will be required for expanded jet and piston engine production of P&WA's three Connecticut plants at East Hartford, Southington, and North Haven.

• **Sundstrand Machine Tool Co.,** Rockford, Ill., has started construction of a $700,000 addition to its manufacturing plant to provide space for increased defense production and to segregate government production from the company's commercial manufacture of transmissions, pumps and accessories.

• **Consolidated - Vultee Aircraft Corp.** has started construction of the country's first integrated plant for mass production of guided missiles, a Navy project, at Pomona, Calif. First production project will be the "Terrier," an anti-aircraft missile designed for land or shipboard launching.

4 BIG REASONS
Why LYON Can Handle Your Sheet-Metal Subcontracts BETTER!

LYON METAL PRODUCTS, INCORPORATED
1089 Monroe Avenue, Aurora, Illinois

Please send me a copy of LYON'S DEFENSE PRODUCTION BROCHURE which explains the 4 big reasons why Lyon can handle sheet metal subcontracts better.

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2 STRATEGIC PLANTS . . . AURORA, ILL., AND YORK, PA.

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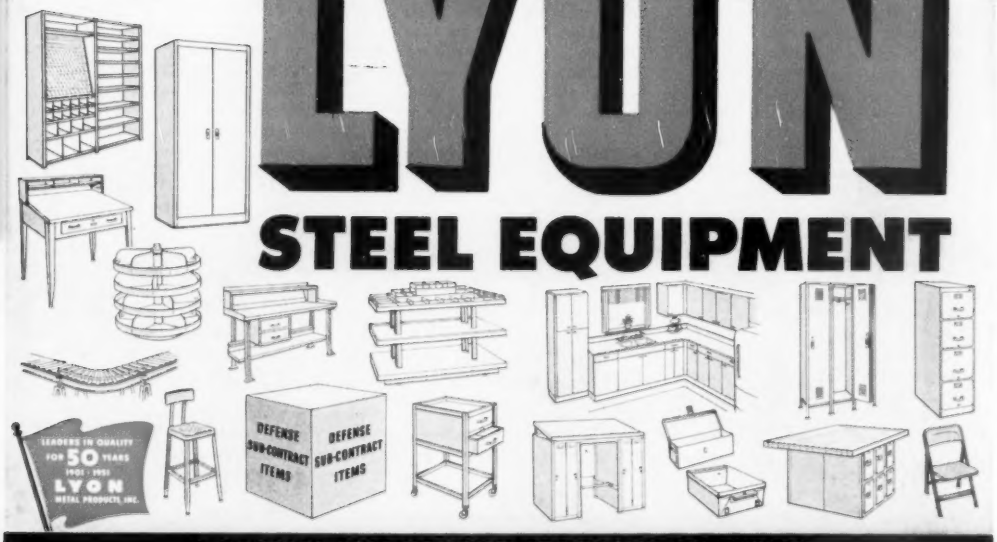
LYON
STEEL EQUIPMENT


LEADERS IN QUALITY FOR 50 YEARS 1901 - 1951 LYON METAL PRODUCTS, INC.
DEFENSE SUB-CONTRACT ITEMS
DEFENSE SUB-CONTRACT ITEMS

A PARTIAL LIST OF LYON STANDARD PRODUCTS

• Shelving	• Kitchen Cabinets	• Conveyors	• Economy Locker Racks	• Display Equipment	• Filing Cabinets	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• Flat Drawer Files	• Drawing Tables	• Folding Chairs	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Tool Room Equipment	• Revolving Bins	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Welding Benches	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks

P&WA Subcontracts Turboprop Work to Allis-Chalmers

EAST HARTFORD, CONN. — Pratt & Whitney Aircraft has let a major subcontract to Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin, for help in building the T-34 turboprop engines for new military aircraft.

The T-34 Turbo-Wasp is a gas-turbine engine that delivers power both to the high-speed propeller at the front and by jet thrust through a tail pipe. It is rated between 5000 and 6000 hp.

The general machinery division of Allis-Chalmers will do about 90% of the manufacturing operations on the engines designated for prototype planes of both the Navy and the Air Force.

Military Orders Solar's Turbine

SAN DIEGO, Calif.—Solar Aircraft Co. has received a Navy tooling contract requiring the plant to set up for production of "thousands" of T-45 fire-fighting turbine-pump units powered by the company's recently developed portable hand-started gas turbine. Airborne generators which use as a power source the same small gas turbines have been ordered from Solar by the Air Force.

Simple in design, with no cooling system, the 165-lb turbine has a rated output of 45 hp; its speed exceeds 40,000 rpm. The pump delivers 500 gpm of water at 100 psi.

Kaiser Metals to Build Republic F-84 Sections

OAKLAND, Calif.—Kaiser Metal Products, Inc., has been awarded a second major-aircraft subcontract—the manufacture and assembly of complete fuselage-aft sections of Republic Aviation Corp's. F-84 Thunderjet fighter for the Air Force.

Production lines for the Thunderjet have been established at the company's Bristol, Pa. plant, parallel to lines working on wing sections for the Canberra, a light bomber being built by the Glenn L. Martin Co.

The plant expects to sub-subcontract 20 to 25% of the precision-machine work for both contracts to other industries in the area.

Engineer Procurement Exhibits

WASHINGTON—Seven new permanent industrial exhibits of products being procured by the Army Engineers will be opened. Locations are: 130 Sutter St., San Francisco, Calif.; Engineer Park, Buffalo, N. Y.; Room 536, Old Post Office Bldg., Atlanta, Ga.; 857 Commonwealth Ave., Boston, Mass.; 121 North Broad St., Philadelphia, Pa.; Room 428, Federal Bldg., Milwaukee, Wisc.; 4735 Marginal Way, Seattle, Wash.

Procurement Office Moved

WASHINGTON—The Central Military Procurement Office has moved from the Old Post Office in Washington, D. C., to Room 3-D-758 in the Pentagon. The move was made by the Munitions Board at the request of businessmen for a more convenient location.

Evans Products Gets $10 Million Of Defense Contracts

PLYMOUTH, Mich. — The Evans Products Co. has been awarded seven prime contracts and three subcontracts totalling more than $10 million to manufacture components for defense equipment.

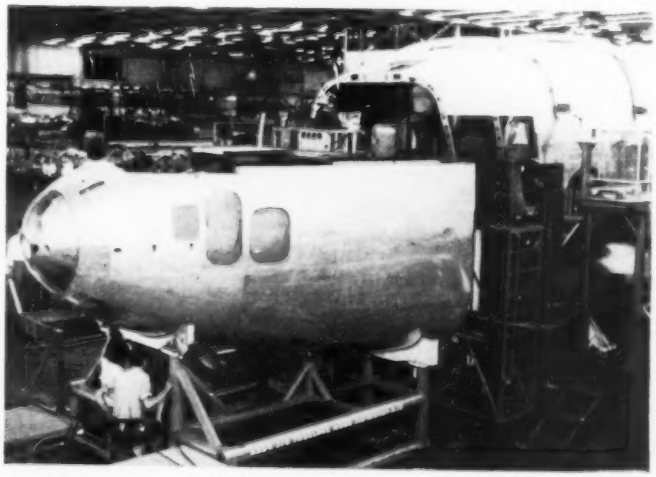
The prime contracts are for machine-gun mounts and elevating and traversing mechanisms, 90-mm ammunition racks, gun-platform assemblies, and tank fenders for the Army Ordnance Department; 30-cal. machine-gun ring mounts for the Navy; frames for the Signal Corps; and engine-winterization kits for the Army Corps of Engineers. The company has also been awarded an additional contract to manufacture motor bodies for the 3.5 bazooka rocket.

As a subcontractor, Evans will make master and articulated-connecting rods for the 3350-30W Wright aircraft engine, parts for the GE jet engine Packard is building, and components for the Boeing Airplane Co.

Contracts for Small Business

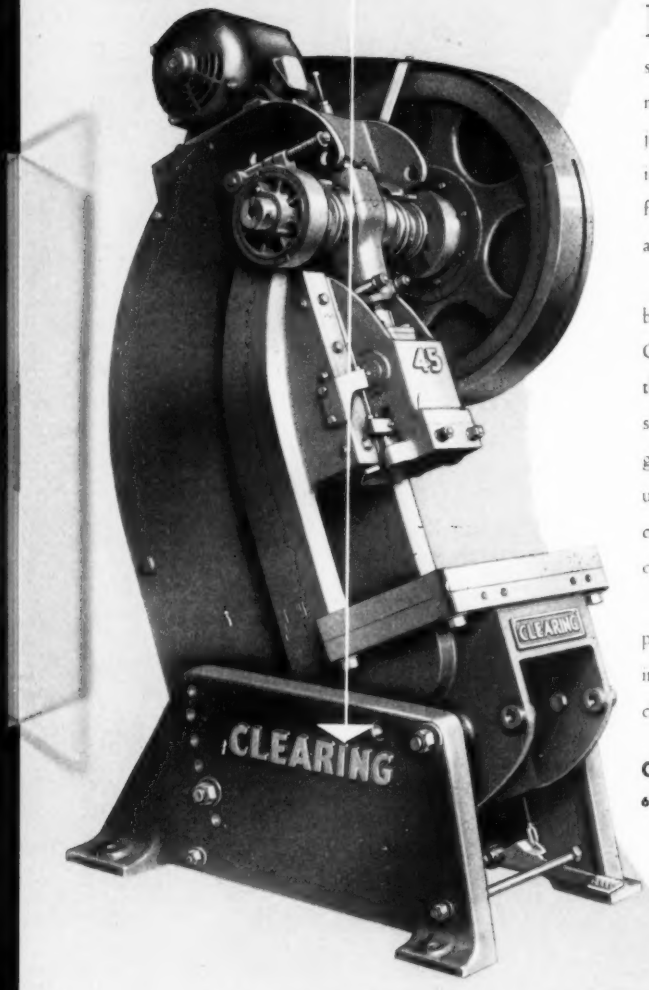
WASHINGTON—All production and construction jobs suitable for small business, down to procurements of $10,000 each, are to be publicized under a new Department of Defense directive from the Munitions Board.

In each purchasing office of the Army, the Navy, and the Air Force, the principal small business specialists has been made responsible for identifying all such procurements and getting them promptly into Department of Commerce Synopses of Proposed Procurements.



Production of C-119 Fairchild Flying Boxcars nearing the final-assembly stage at the Kaiser-Frazer Willow Run plant. In addition to normal output of automobiles, K-F is working on five major defense contracts. Kaiser Metal Products, Inc. is expanding its facilities at Bristol, Pa. to handle subcontract work for Republic Aviation Corp. in addition to its present work for Glenn L. Martin

how to recognize a modern OBI press



IF YOU'RE among those who consider that OBI presses haven't changed much in 40 years—that a new one is just an old one without the wear—we invite you to examine the Clearing line for a pleasant and exceedingly profitable surprise.

You can recognize a modern OBI by the Clearing name on it. Clearing OBI presses are newly designed from the ground up. Every feature, from the steel weldment frame and extra long gibbing, to the quick acting clutch and unique connection design, has been incorporated because it makes a definite contribution to lower stamping costs.

You can't afford to meet future competition with anything less. Be sure to investigate Clearing before you purchase any OBI—from 30 tons upward.

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THE WAY TO EFFICIENT MASS PRODUCTION

Prime Contract Awards By State Reported By Defense Department

WASHINGTON—The following Munitions Board report of Military Prime Contracts Awards, by State, has been compiled for general information only. It shows the geographic pattern of distribution of military contracts. The survey covers prime contracts only. It does not include subcontracts.

The accompanying figures exclude Navy contracts of less than $5000; Air Force contracts of less than $10,000; Army contracts of less than $5000 from July through Dec. 1950, and Army contracts of less than $10,000 in the period following Jan. 1951.

State	Total Amount	% of Total	State	Total Amount	% of Total
Ala.	$124,761	0.6	Nev.	1,739	*
Ariz.	49,910	0.2	N. H.	69,629	0.3
Ark.	13,953	0.1	N. J.	989,348	4.7
Calif.	2,820,018	13.4	N. M.	19,583	0.1
Colo.	52,207	0.3	N. Y.	3,843,279	18.3
Conn.	1,228,090	5.8	N. C.	183,503	0.9
Dela.	9,280	*	N. D.	2,260	*
D. C.	168,424	0.8	Ohio	1,449,442	6.9
Fla.	49,357	0.2	Okla.	65,325	0.3
Ga.	163,212	0.8	Ore.	90,258	0.4
Idaho	10,640	0.1	Pa.	931,687	4.4
Ill.	1,037,338	4.9	R. I.	190,696	0.9
Ind.	1,346,475	6.4	S. C.	99,505	0.5
Iowa	130,744	0.6	S. D.	6,172	*
Kan.	242,199	1.2	Tenn.	137,445	0.7
Ky.	46,708	0.2	Tex.	493,404	2.4
La.	128,390	0.6	Utah	19,270	0.1
Maine	65,160	0.3	Vt.	19,014	0.1
Md.	478,165	2.3	Va.	143,163	0.7
Mass.	737,603	3.5	Wash.	532,443	2.5
Mich.	1,629,660	7.8	W. Va.	25,676	0.1
Minn.	208,548	1.0	Wis.	435,752	2.1
Miss.	32,650	0.2	Wyo.	10,567	0.1
Mo.	400,313	1.9			
Mont.	9,328	*	Total Amount $21,019,955		
Neb.	68,662	0.3	* Less than 0.05%		

Navy Contracts For LST's

WASHINGTON — The Navy has awarded contracts for construction of 13 landing ships tanks (LST's) with a total cost of more than $49 million. Companies getting the awards are: Bath Iron Works, Bath, Maine, 3 ships; Ingalls Shipbuilding Corp., Pascagoula, Miss., 5 ships; and Christy Corp., Sturgeon Bay, Wis., 5 ships. In addition the Bath firm is building two other LST's for which it was awarded contracts in July. It has been designated as lead yard for the LST program.

GE To Build Microwave Equipment

SYRACUSE, N. Y.—A contract has been awarded to the General Electric Company Electronic Park plant for additional microwave equipment for military use. Dollar value of the contract was not disclosed.

The new equipment will improve Army communications systems overseas and will provide reserve facilities in the United States.

About 90 West Coast manufacturers were represented at the Military Business Opportunity Display in the Hollywood Park Turf Club, Inglewood, Calif. Literally hundreds of fittings and parts were farmed out on the spot to subcontractors with facilities to produce them. Paul V. Gaughen (left), of Consolidated Vultee makes a sale to J. J. Brown (center), president, Western Stampings, Inc., to produce magnesium aileron quadrants for Convair's B-36. George Byrnes, AF Small Business Office, looks on

LATEST DEFENSE CONTRACTS

ORDNANCE AWARDS

Tank-Automotive Center, Detroit

DeMattia Machine & Tool Co., Clifton, N. J.—cupola assembly, exceeds $250,000.

Hinson Mfg. Co., Waterloo, Iowa—gun-shield cover, $183,249.

Rocklin Mfg. Co., Detroit—door assembly, exceeds $250,000.

General Body Mfg. Co., Kansas City, Mo.—motor vehicle parts, $159,952.

White Motor Co., Cleveland—truck tractor, exceeds $250,000.

Tyson Bearing Corp., Massillon, Ohio—roller bearings (no figure).

Rochester Ordnance District

Eastman Kodak Co., Rochester, N. Y.—fuzes, exceeds $250,000.

Precision Castings Co., Inc., Fayetteville, N. Y.—time fuzes, exceeds $250,000, shell fins, exceeds $250,000.

Revere Copper & Brass Co., Rome, N. Y.—cartridge cases, exceeds $250,000.

Precision Castings Co., Inc., Syracuse, N. Y.—81 mm mortar metal parts, exceeds $250,000.

New York Ordnance District

Electronic Computer Corp., Brooklyn, N. Y.—spare parts and test equipment, $164,500.

Singer Sewing Machine Co., New York—sewing machines, $151,659.

Detroit Ordnance District

Link Engineering Co., Detroit—gages.

Fargo Div., Chrysler Corp., Detroit—tank-automotive spare parts.

ENGINEER AWARDS

Pittsburgh District Engineer

Dewey Bros., Inc., Goldsboro, N. C.—balk-aluminum dock, exceeds $250,000.

Ceco Steel Products Corp., Chicago—Bailey bridge, exceeds $250,000.

Decatur Iron & Steel Co., Decatur, Ala.—Bailey bridge, exceeds $250,000.

Marinette Marine Corp., Marinette, Wis.—Bailey bridge, exceeds $250,000.

Steelcraft Mfg. Co., Rossmoyne, Ohio—Bailey bridge, exceeds $250,000.

SIGNAL CORPS AWARD

Philadelphia Procurement Agency

Connecticut Telephone & Electric Co., Meriden, Conn.—telephones, $209,858.

Kings Electronic Co., Tuckahoe, N. Y.—mountings, cable assembly, exceeds $250,000.

Emerson Radio & Phonograph Co., New York—radio sets, exceeds $250,000.

Utility Electronics Corp., E. Newark, N. J.—radio sets, exceeds $250,000.

Wilcox-Gray Corp., Charlotte, Mich.—converter, $112,814.

Arey Machine Co., Hillside, N. J.—receptacle connectors, exceeds $250,000.

Freed Radio Corp., New York—radiac-detector charges, $178,188.

Raytheon Mfg. Co., Waltham, Mass.—radio sets, exceeds $250,000.

Times Facsimile Corp., New York—facsimile sets, exceeds $250,000.

Ralph C. Coxhead Corp., Newark, N. J.—teletypewriter set, exceeds $250,000.

Kelley-Koett Instrument Co., Cincinnati—radiac-detector charger, exceeds $250,000.

Highway Trailer Co., Edgerton, Wis.—truck chassis, $152,467, exceeds $250,000 (2 contracts).

Hoffman Radio Corp., Los Angeles, Calif.—receivers, $161,282.

(Continued next page)

Looking for subcontractors for defense contracts?

New York State, through its "Industrial Preparedness Survey," has inventoried the production facilities available within the State. Use this free public service to help you find the subcontractor you need.

New York State is ready to help you locate qualified subcontractors to supply parts or assemblies.

This assistance is based on a recently completed inventory of metalworking, woodworking, paper, textile and plastic facilities.

This information, compiled by the N. Y. State Department of Commerce from thousands of questionnaires sent to all known companies in these industries, has been classified, coded and recorded so that the number, kind and capacity of machines can be easily found and identified.

Thus, firms with the required facilities and capacity can be quickly suggested as subcontractors.

Any inquiry from you will be handled exactly as you specify. For example, you may wish to contact a list of firms qualified by their general facilities or special tools to perform the work desired. Or, you may prefer to have us determine the current interest of these firms by outlining to them such details as you may submit to us. If you do not wish to have your identify disclosed, we can forward the result of our circularization to you for direct contact. In every instance, the New York firms suggested will be those which are known to have the required equipment based on an examination of our 1951 "Industrial Preparedness Survey."

Just one of many services—Aid in locating subcontractors is just one of the many services available to both large and small manufacturers. A special bulletin describes in detail the defense services of New York State Department of Commerce. Copies are free.

Write for bulletin

New York State Department of Commerce
Room 126, 112 State St., Albany 7, N. Y.

Please send me a copy of your free bulletin "Defense Services of the New York State Department of Commerce."

*Name*_____

*Position*_____

*Company*_____

*Street*_____

*City*_____ *State*_____

DEFENSE AWARDS . . . . . Cont.

Precision Associates, Inc., Brooklyn, N. Y.—antenna loading, $121,688.
Kleinschmidt Labs, Inc., Deerfield, Ill.—teletypewriter switching center, $132,326.
Radio Corp. of America, Harrison, N. J.—electron tubes, exceeds $250,000.
General Electric Co., Syracuse, N. Y.—rawin set, exceeds $250,000.
Malkin-Illinon Co., Irvington, N. J.—mounting rack, $107,533.
Modecraft Co., Brooklyn, N. Y.—antenna mast, exceeds $250,000.

NAVY AWARDS

Bureau of Ordnance
Washington 25, D. C.

Yardney Electric Corp., New York—secondary batteries, $168,500.
Simplex Wire & Cable Co., Cambridge, Mass.—submarine mine cable, exceeds $250,000.
Graybar Electric Co., Inc., Washington—locking plate, shackles, and clips, exceeds $250,000.
Norris Thermador Corp., Los Angeles, Calif.—cartridge cases, exceeds $250,000.
Arma Corp., Brooklyn, N. Y.—fire control equipment spare parts, exceeds $250,000.

Navy Purchasing Office
New York

Turbine Equipment Co., New York—oil pumps and spare parts, $160,962.
Philco Corp., Philadelphia—receiver test sets, exceeds $250,000.

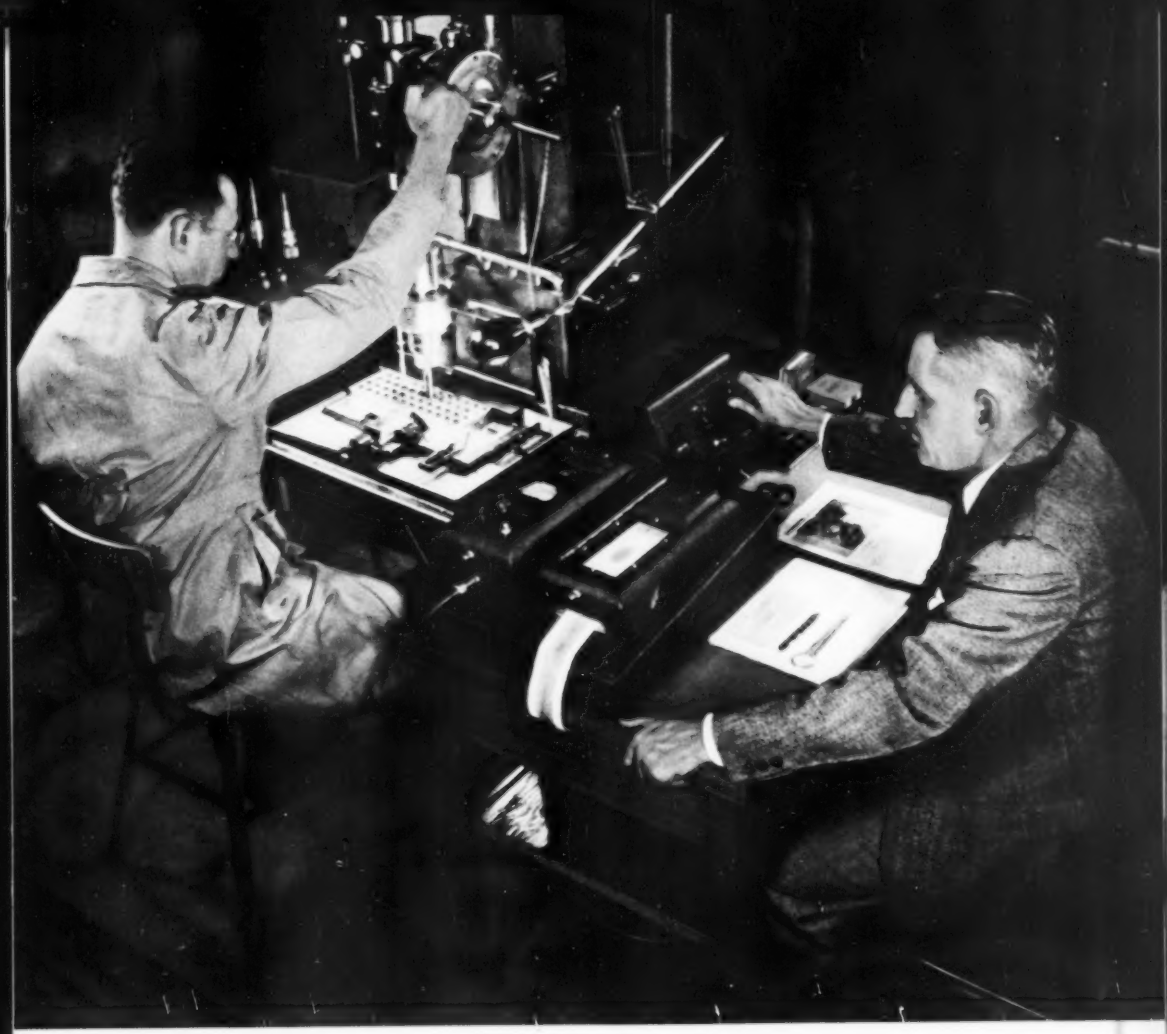
Naval Construction Battalion Center
Port Hueneme, Calif.

Le Roi Co., Milwaukee, Wis.—compressor, $125,670.
Blaw-Knox Div., Blaw-Knox Co., Pittsburgh—concrete spreader, exceeds $250,000.
Rome Grader Corp., Rome, N. Y.—road grader, exceeds $250,000.
Iowa Mfg. Co., Cedar Rapids, Iowa—crusher screening plant, exceeds $250,000.
Pioneering Works, Inc., Minneapolis, Minn.—crusher screening plant, exceeds $250,000.

AIR FORCE AWARDS

Air Materiel Command,
Wright-Patterson A. F. Base, Dayton

Douglas Aircraft Co., Inc., Tulsa, Okla.—facilities, exceeds $250,000.
Kearfott, Co., Inc., Little Falls, N. J.—compass system, exceeds $250,000. (2 contracts).
Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y.—spare parts, $138,357, facilities, exceeds $250,000.
Canton Drop Forging & Mfg. Co., Canton, Ohio—propeller extrusions, exceeds $250,000.
Gallmeyer & Livingston Co., Grand Rapids, Mich.—surface grinder, $107,070.
North American Aviation, Inc., Columbus, Ohio—aircraft spare parts, exceeds $250,000. (2 contracts).
Hotpoint, Inc., Chicago—turbosuperchargers, exceeds $250,000.
Canadian Commercial Corp., Montreal, P. Q., Canada—aircraft spares, exceeds $250,000.
Aero Products Div., GMC, Vandalia, Ohio—facilities, propeller controls and spare parts, exceeds $250,000.
Lockheed Aircraft Corp., Burbank, Calif.—aircraft spare parts, exceeds $250,000.
Douglas Aircraft Co., Inc., Santa Monica, Calif.—aircraft spare parts, exceeds $250,000.
Pacific Airmotive Corp., Burbank, Calif.—engine overhaul, $200,000.
North American Aviation, Inc., Los Angeles, Calif.—fuel tanks, exceeds $250,000.
Beech Aircraft Corp., Wichita, Kan.—fuel tanks, exceeds $250,000.



Why GTD Greenfield?

These men know what a tap will do *before* it does it. They are experts in tap torque testing. At "Greenfield's" research laboratory, torque tests are permanently recorded on oscillograms by the electronic torque meter. Careful study of the torque records provides the basis for continuing tap improvement.

The big three in "Greenfield's" program — careful research, engineering developments, better manufacturing techniques — have made "Greenfield" leaders in the threading tool field. When you buy "Greenfield," you know you're getting the best today. Tomorrow, "Greenfield's" research and development will make the best *better!*

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

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POLISHED FLUTES

POLISHED FLUTES give greater accuracy, better wear, less breakage. And all this with less power consumption. Ground between centers then polished, finely proportioned flutes and concentric webs are assured, chip disposal is facilitated. On deep hole drilling polished flutes are a MUST, on average jobs a PLUS. Don't be satisfied with less, insist on the best.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

Greenfield, Massachusetts

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol O.C. Turbine Oil

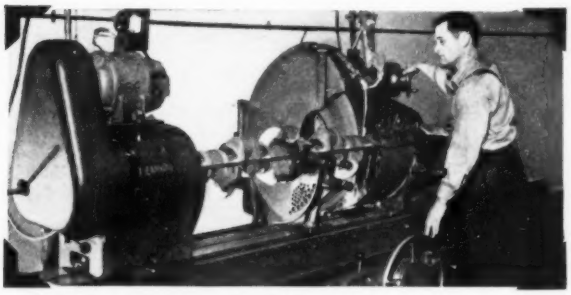
APPLICATION Hydraulic medium

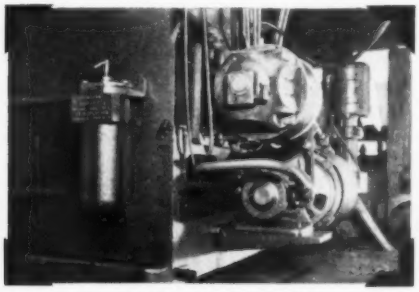
UNIT Control on hydraulic grinder Landis Type C – 36 in. wheel

SERVICE Crankshaft and cylinder grinding

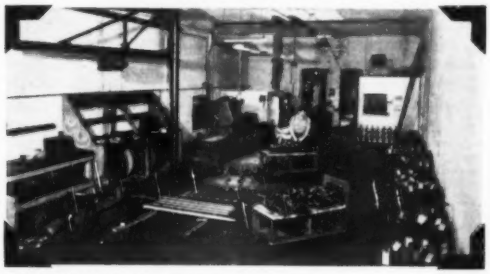
FIRM Crankshaft Co., Los Angeles

Inhibited oil saves $1000 per year in "down time"!





CALOL O.C. TURBINE OIL–15 has operated the hydraulic feed on this heavy-duty grinder for 5 years without the formation of any sludge or corrosion in the system. With the oil used previously, it was necessary to make a complete system clean-up twice a year at a cost each time of about $500 in labor and work-hours lost. The filter and pump (right) are checked and cleaned every 6 months. Only leakage make-up was added during the five years to the original charge of Calol O.C. Turbine Oil.



CRANKSHAFT CO., owned by Mr. A. W. Alexander (above), specializes in precision grinding, makes many of the shafts used by top racing drivers. Mr. Alexander says, "By keeping the feed control on my machine working smoothly, Calol O.C. Turbine Oil helps us to turn out finer work."

REMARKS: Calol O.C. Turbine Oil is valuable in many services where even minor oxidation or corrosion may cause trouble. It resists the action of both fresh and salt water. Calol O.C. Turbine Oil comes in several viscosity grades to meet all operating conditions.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How Calol O.C. Turbine Oil cuts costs in hydraulic systems

Used as the hydraulic medium in feeds and lifts of any kind, Calol O.C. Turbine Oil will not form carbon or foam excessively.

A. Contains very effective oxidation inhibitor—will not deteriorate and plug lines and retard action of cylinders.

B. Corrosion inhibitor prevents rusting and pitting—has high metal-wetting ability.

C. Separates readily from water or other contaminants—dirty oil may be reclaimed easily...charge lasts indefinitely, leakage only cause for replacement.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

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STEERING GEARS
... Put There by
'SURFACE' RX PREPARED ATMOSPHERES

Ever hear of an auto accident due to a steering gear going bad? Quite likely you never will, because above is proof that steering mechanisms (other parts and products, too) are made *safe and dependable.*

● All vital and moving parts of the steering assembly undergo one or more controlled atmosphere heat treatments: *carburizing, cyaniding, clean hardening,* where results are uniform and consistently within close limits.

RX Prepared Atmospheres

Atmospheres for these 3 distinctly different heat treat processes in the plant producing these assemblies are prepared in 2 centrally located 'Surface' RX generators manifolding the RX carrier gas for all atmosphere requirements. Saves money, saves space!

'Surface' is a pioneer in prepared atmosphere equipment, furnishing not only RX, but also DX, NX, HX, HNX, AX and Char-Mo gas atmospheres. *Send for Bulletin SC-155 on prepared atmospheres. Write today, on your letterhead.*

SURFACE COMBUSTION CORPORATION
TOLEDO 1, OHIO

living should at least work for an employer that he can get along with better than 60% percent of the time. It would be impossible to find anyone with whom agreeance can be had all the working time. Actually an individual can not get along with himself continually for every minute in the day. He will get disgusted with the way he actually does something. It is human nature to have off days. They may not be many, but nevertheless they do exist.

So as a worker changes a job he must be sure that he is not jumping from the frying pan into the fire. In order to make certain that conditions are as the employment manager paints them, he wants to talk with the boss. He wants to make sure that the boss knows what the score is; whether the boss is one who likes to talk about how *he* gets the job done; whether he runs down the other workers and promises the world on a silver platter. All these things affect the working conditions of the employee.

The idea of interviews has always been thought of as a one-sided deal. It was for the company to look over the prospective employee. While this generally is the case it does allow the prospective employee an opportunity to see what the company policies are. If he is shrewd he can often detect things that will affect his position with the company.

The worker who is going to get ahead today must be alert to conditions within an organization. He must know how such conditions will affect him and his job. It is important for the well being of any person to have harmonious working conditions. If a person can not stand the conditions under which he is forced to spend a good part of his day, he soon becomes a misguided individual who has little or no productive capacity.

Therefore a worker should actually be given an opportunity to talk with the man he is to work under. It will pay dividends for the company. Too many companies take an attitude they are doing a man a favor to hire him. This is a badly mistaken idea. They hire a man because they need his help. Without employees a company would be nothing. Yet the lower strata of management seems to forget this all-important phase. Maybe top management should stress employee relations more. Perhaps more conferences with management and workers should be held.

In any case don't be disturbed if a worker wants to look over his boss and his working area. It means the man is aware that life means something besides slavery. He will make you a better employee if you are worthy of the assistance that he can give you.

Charles D. Townsend
West Hartford, Conn.

•

THERE ARE many things in the machine industry that has changed since the war, and the position of the foreman has not escaped this turnabout.

The power of unionism is being felt more and more. In Europe this

YESSIR! EVERYTHING IS JUST LOVELY! ALL 36 OF THESE SPINDLES PASSED INSPECTION - THEY'RE SO MUCH UNDERSIZE TH' INSPECTOR PASSED 'EM ON TO T'FOUNDRY FOR REMELT. YOUR STOOO - YOUR ASSISTANT ORDERED ME TO SPEED UP TH'JOB BY TAKIN A DEEPER CUT. "NEVER TAKE TWO CUTS WHEN Y'CAN DO IT IN ONE" SEZ HE. IT WAS A FINISH CUT I WAS TAKIN' - SIR
IF TH' RAMROD HAD TWO MORE ASSISTANTS - WE'D NEVER HAVE TO WAIT FOR SCRAP
THEY'RE EVEN TOO LOW FOR THE CUPOLA
YEP!
"COST CUTTING"

PRODUCTION ACCURACY *becomes* TOOL ROOM ACCURACY

with

ROCKFORD *ECONOMY LATHES*

That's why we say it's the best lathe value on the market today. Built by expert machine tool mechanics from high quality materials, it has sufficient weight and power to stand up under general production and maintenance use, and still provide the accuracy requirements needed for the tool room.

Design features include a big, accurate lead screw, uninterrupted by keyways, an independent feed shaft with an interlocking safety clutch, a handy thread cutting dial as standard equipment, double wall apron, drop-lever feed engagement and every other essential found in a high-quality lathe.

Any of our representatives will give you full specifications on the medium-sized, economy-priced Rockford Economy Lathe, or we will gladly send on request a copy of our bulletin No. 900A

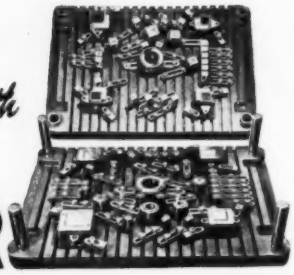
MEDIUM-SIZED
ECONOMY-PRICED

ROCKFORD ECONOMY LATHES — 16" and 18"

521

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS

Get into Production in a few hours with



WHISTLER ADJUSTABLE DIES

Whistler Adjustable Perforating Dies are in use everywhere . . . working in both large and small presses.

There are plenty of other advantages in using Whistler Adjustable Dies. It makes sense to get the complete story. And it's easy to do. Write for your Whistler Catalog today.

Whistler perforating dies now offer a double-barreled advantage in getting into production faster. Standard sizes of round hole punches and dies . . . 1/32 to 3" . . . can be shipped promptly. Special shapes . . . squares, ovals, rectangles, group and notching dies, are quickly made to order.

Equally important, set-ups are simple . . . take only a short time. Same units can be rearranged or units added in setting up different jobs. Production is thus speeded while die costs are amortized through continued re-use.

No special tools are needed. All parts are interchangeable. The heavy duty series of punches and dies easily pierce material up to 1/4" mild steel.

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power has been exercised for many years, in some cases for decades with the result that labor has set up governments of their own. Their demands here now runs mostly through political channels. It is also known that labor wants industrial executives of their own choosing. This example is probably a forerunner to such activities on a broader front.

I used to ask myself what sins industry has committed in earlier days being now exposed to, at least some instances, to much severe punishment.

One of these sins is that business kept workers in a state of uncertainty, not caring whether the man or his family were dead or alive, and this is now one of the results —aggression. Discipline carried to its extreme, produces more work as long as jobs are scarce, but as it is now, discipline has lost its grip entirely, which is just as bad. Much trouble is traceable to lack of education both regarding employer and employee.

I cannot accept Ed's thought that the reason for demanding an interview with the foreman is to investigate whether or not the applicant will be able to work with him not for him. It is an aggression. Unfortunately, I think there will be more of them without any good intention. It is a matter of economic jealousy.

Yes, indeed, there is a whole lot of red about it, no matter how sensibly you look at it. I don't believe the applicant is able to judge a foreman by having a talk with him, he must have some experience working for him before he can tell how he likes him. A man who does not accept the companies rules relative to the hiring of help should be kept outside. I agree with Ed that "A foreman isn't much if he has to go on exhibit like a prize pig."

Any psychological testing must divulge some type of discipline; if not, there will be very little production. Therefore, it is not practical for a new worker to look over his possible boss—it is going too far.

A. E. Fristedt
Stockholm, Sweden

•

BOSS-MADE ECLIPSE

THE APPRAISAL of a man's worth is not dependent upon seniority. A good mechanic may be with a firm for ten or more years, be a conscientious worker and never make a mistake, and still wouldn't be suitable material for advancement. Seniority is only effective under certain

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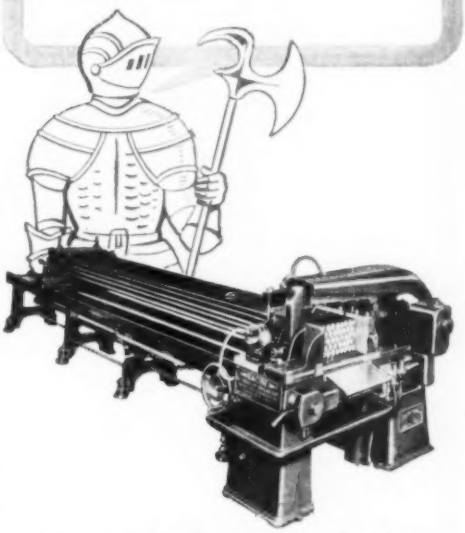

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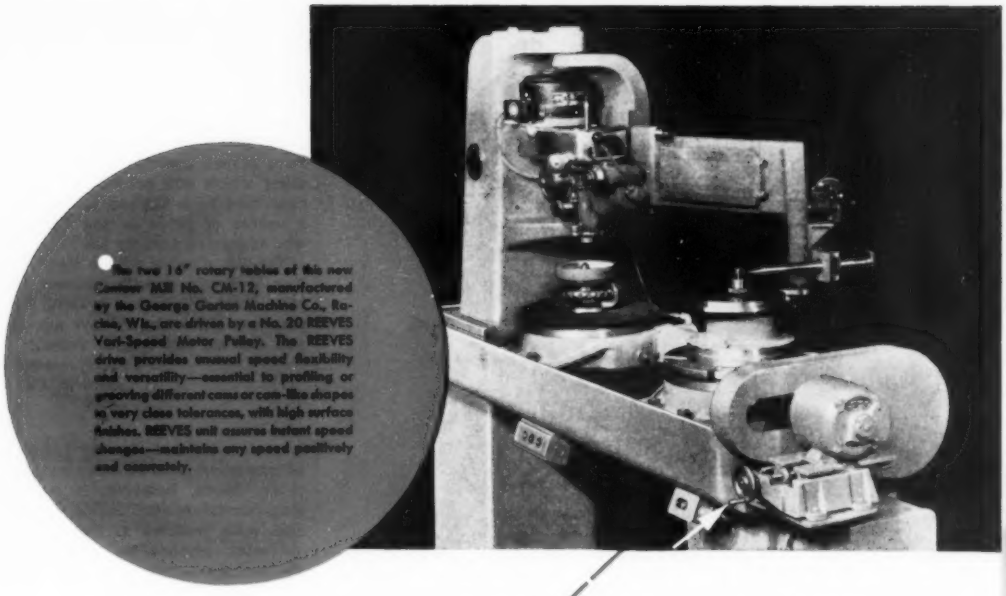
conditions but when it is used as an argument for advancement it is out of reason.

The determination as to whether a man is suitable for a certain job should be based on qualities shown by the individaul. An observant foreman can readily pick out a man whom he thinks will be successful in another department materially affecting his own. To spot out a man in the toolroom who is good material as a tool designer one has to consider several things: Does he thoroughly understand his business as a toolmaker? Has he good common sense to know the value of time in the design of a tool? Does he know the value of "good enough" or is he one of these white-aproned misfits who feels that everything that goes through his hands has to glisten like a secretary's face at nine in the morning?

Were I to select a man for such a job I'd consider the candidate's mathematical potential; I wouldn't jeopardize his chances because he didn't have four or six units of college algebra—I'd choose the one who had an inventive mind and had proven such by the suggestion he had made on some of the jobs that had gone through his hands. His calculating aptitude can easily be a wedge to acquire sufficient mathematical training while on the job. There is nothing so effective as learning by doing—to see where the application is productive of something of practical value. Abstract theory doesn't amount to a darn to the man who designs small tools, such as dies, jigs, and fixtures. He has to have a working knowledge of shop trigonometry and the use of logarithms, both of which can be ac-

"Whattya mean—have I got my home workshop outfitted yet!"



The two 16" rotary tables of this new Contour Mill No. CM-12, manufactured by the George Gorton Machine Co., Racine, Wis., are driven by a No. 20 REEVES Vari-Speed Motor Pulley. The REEVES drive provides unusual speed flexibility and versatility—essential to profiling or grooving different cams or cam-like shapes to very close tolerances, with high surface finishes. REEVES unit assures instant speed changes—maintains any speed positively and accurately.

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VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

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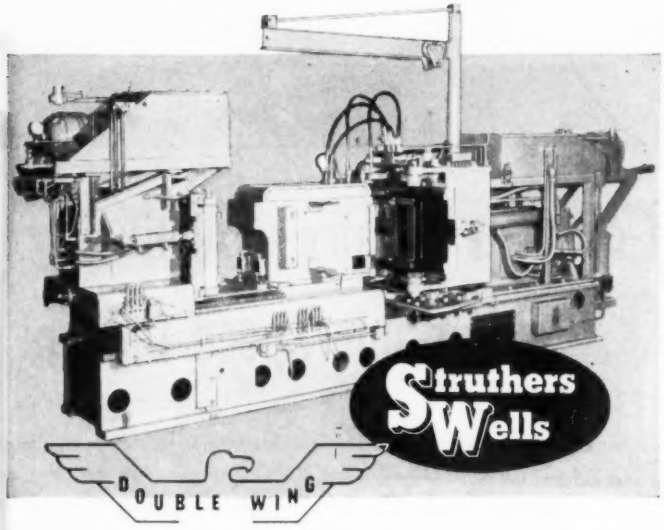

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Typical of the continuous engineering study and design progress in Struthers Wells Tangent Bender production is this latest Double Wing model. Designed originally to form refrigerator and other appliance shells in one piece, today the machine is even more versatile—with an auxiliary bending mechanism which forms bottom flanges at the same time in one continuous motion. • Struthers Wells Tangent Benders in many models are serving American industry everywhere. Let us send you our latest descriptive Catalog, and consult on your metal bending problems.

STRUTHERS WELLS *Corporation*

***Machinery Division:* TITUSVILLE, PENNA.**

quired with the little extra time he must find after dinner.

There are times when a man is dormant, so to speak, and will snap out of it with remarkable speed when placed in a position which affords good prospects for advancement. He'll reveal that mysterious something which will prove his worthiness—and be a marked success and a source of pride to the foreman who suggested him for the job.

Yes, Ed, playing with a man's future is pretty serious business but it's a great satisfaction to know that you have given him a shove upward and can see him benefit thereby.

John Homewood
Ontario, Calif.

•

IF EFFICIENCY is to be the keynote, advancement must be based on merit alone. Merit, however, is such a comprehensive word including as it does such features as competence, character, personality, manner etc. The technically and practically competent person with an objectionable manner is so often more of a business liability than an asset and, while ability is indispensable to the success of the individual, something more than mere technical and practical ability in the individual is required for the success of the business that employs him. What a nightmare to the busy chief to be saddled with a brilliant but touchy assistant, forever feeling aggrieved and always in need of being humored before he can give of his best. Many very competent men dim, if they do not actually spoil, their prospects by being too smart or by being what is politely called, difficult.

In modern business with its wide horizons, promotion by seniority would inevitably lead to the collapse of the company foolish enough to proceed on such lines. Promotion by seniority can be seen as an easy way out in order to escape the unpleasantness of promoting a young man over the head of an older employee but I have never known it make for efficiency or extended industrial frontiers. If an unpromoted man with longer service than a promoted one lodges a complaint, there will be a reson for his non success, if the reason is sound and above board it need only be explained to the disappointed man, after which the next move is on him. If the reason is that his record of achievement with the company is less than that of his shopmate he has no justification for complaint. The important point here is to be firmly and polite-

MULTIPLY YOUR PRODUCTION OF IDENTICAL PARTS . . .

The PRODUCTO BAR-MATIC MACHINE, ideal for repetitive work, will form, groove, bevel, chamfer and cut-off four identical pieces in one rapid operation. Here are the facts —

CAPACITY: Round, hexagonal or square stock up to $\frac{5}{8}$" diameter can be machined and cut-off in lengths up to $6\frac{3}{8}$".

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Are you looking for an economical, rapid, yet accurate means of producing thousands of identical pieces from bar stock? If this is your problem, have our engineers discuss thoroughly your specific requirements — write for bulletin on the Producto Bar-Matic today.

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For years Webber has dedicated itself to the production of gage blocks at a price that even the smallest shop can afford.
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ly frank in explaining the reason for his non-success. The chance to succeed is present in every job no matter how humble or humdrum. The person who has the ability, mental and physical, to exert himself forces himself on the notice of his superiors and compels their admiration, often quite unconsciously.

In order to achieve recognition, a man must give evidence of deserving it and if he gives no such evidence in his daily task it can be safely concluded that he would be no more enterprising in another more important. In dealing with Lorring, Al should make no apology or excuse. Lorring should be told firmly and kindly that in Al's opinion he does not possess the requisite qualities for the job concerned but if something more suited to his talents comes along he will be considered.

C. D. Mackinnon
Lanarkshire, Scotland

•

BARGAIN SHOPPER

Is it labor-stealing for Ed to hire a toolmaker from Universal, if that toolmaker is on Universal's payroll at the time? It is definitely *not* labor stealing!

In America, it is the privilege and the right of an employee to quit a job any time he wants to, and no one has the right to point a finger of scorn at him for so doing. It is likewise the right of an employer to expand his business, build another wing for the erecting floor, close a west-coast warehouse, or put a new percolator on the market whenever he sees fit. He would resent it very bitterly if he were told not to do any of those things. In America, we still have a fair share of free enterprise; it benefits all of us, and if at times those privileges that are good for all, hurt a few, that's too bad, perhaps, but it is Life; it is also the best way of living that exists anywhere on the face of the earth today.

If I love a girl, go with her for three years, but am unable to decide whether Life would be Beautiful with her for a constant companion, that's my right to be undecided. But if the girl's patience wears out, and she decides to accept a proposal from George, who did make up his mind, do I have a right to complain? I do not. I had my chance, and I lost it.

Many of us flunk some of life's tests. Universal just flunked out in the case of the toolmaker they couldn't keep. Should I weep? Not

J&L STEEL

TURN IN YOUR SCRAP — HELP BALANCE STEEL PRODUCTION!

You have some of the Mesabi Range cluttering up YOUR plant!

The iron and steel scrap in *your* operation—old machinery, parts, fixtures, etc.,—is worth twice its weight in precious Mesabi iron ore. Today this scrap is a vital natural resource. *Maximum steel production is impossible without it.* Every pound of scrap you can salvage is needed to help meet today's record demand for the steel to build a strong defense and to meet civilian needs.

COMB YOUR OPERATION FOR STEEL SCRAP NOW!

No matter what business you're in, you probably have more scrap than you realize. Appoint a responsible man to round it up. Set a date to have the job done. Your local scrap dealer will pay you for the scrap you collect. He'll speed it back into production. Act now. The need is urgent.

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Parker precision press and hand marking type holders are engineered for quick, accurate interchangeability of type. Type is furnished in all standard character sizes from 3/64" to 1/4" or in special type and symbols to your specifications.

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Sharp, clean, raised 1° increments and a double row of perfect figures, from 10 to 170 in this semi-circular azimuth scale all hardened into a solid tool steel block. Parker dies cost less because they perform perfectly—longer.

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Parker steel trade mark, identification, part number of inspection stamps are made in dozens of standard shapes and designs. Special stamps in any quantity, any size to mark any material are also manufactured to your specifications.

REMOVABLE INSERT MARKING DIES

This removable segment die is used for stamping and codeing military shell cases. Here one die replaces three used previously and eliminates two stamping operations, thereby decreasing marking cost by over 60%. Another application of Parker experience and craftsmanship.

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Dies like this for hot stamping plastics or wood are being manufactured continually by Parker. The most elaborate customer specifications are quickly and expertly transferred from blue print to fine tool steel and expertly heat treated and finished for longer life.

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by Parker

me. Universal had the man on their payroll. If the man looked good to them, then it was up to them to provide the right working conditions, meet the going rate, offer a special consideration, or do whatever was necessary in order to keep the man with them. Apparently they did none of those things. As far as the man was concerned, they didn't make the grade—they flunked his test; so he sought a better job and found it. He had the right to do just that.

The wants of the average man are simple: a certain measure of security, a wage that fits his particular cosmos, suitable working conditions, a certain measure of recognition—and there you have it. That's the average man. Another type of man places immediate recognition in the form of a robust pay-check first, while the exceptional man is looking for extra responsibility, and the chance for advancement.

To obtain workers, when the competition is tough, it is necessary for an employer to appeal to one or more of the fundamental instincts that influence them. To keep workers, it is necessary to satisfy them, and that is a matter that requires constant attention. It all sums up to one answer of one of Life's greatest axioms: one gets out of Life what one puts in—no more, no less. Keep 'em happy, and you have 'em; forget to keep 'em happy, and you won't have 'em. It is just as simple as that.

James K. Matter
Detroit, Mich.

•

ALICE IN BLUNDERLAND

ONE of the chief objections to setting up a well-defined grievance plan is management's belief that such a plan will increase the number of grievances and cause men to think more about petty irritations and getting them settled than about their work. Many management leaders honestly feel the employee with a grievance can come right up to the front office and have it settled on the spot if he so desires. In theory this may be true in some companies, but in practice it seldom, if ever, works out. Employees cannot be permitted to wander around a company's plant and office looking for someone in authority to settle a minor grievance. Nor can they be permitted to go over the heads of foremen, supervisors, and factory superintendents at will.

It is important to remember that a grievance; say a complaint that a worker deserves a raise because he does all the sloppy and tough jobs,

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IS THE ANSWER TO YOUR STEEL-HARDENING PROBLEMS IN LOW-CARBON, COLD-ROLLED OR HIGH-SPEED STEELS

FOLLOW THE LEAD OF LEADING MANUFACTURERS—USE HARD-N-TUFF FOR MAINTENANCE AND PRODUCTION.

HARD-N-TUFF hardens steel quickly and inexpensively.

HARD-N-TUFF can be used successfully on all types of tools, parts, dies and other low carbon or high speed materials.

HARD-N-TUFF produces an improved quality of steel with a maximum depth of hardness. You can make your own high speed drills from ordinary carbon drills; thus treated, they will not clog or gum in plastics or other resinous material.

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HARD-N-TUFF adds certain vital chemicals which are fused deeply into the steel, effecting a complete molecular change. The outer surface becomes a far higher grade of steel, while the inner core remains tough and flexible, PROVIDING GREATER STRENGTH BACK OF CUTTING EDGES.

HARD-N-TUFF is safe to use—contains NO CYANIDE or other toxic ingredients.

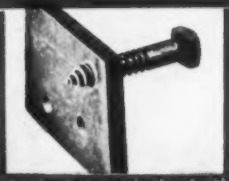
HARD-N-TUFF powder is extremely easy to use. NO SPECIAL EQUIPMENT IS REQUIRED. For small parts, all you need is a gas or acetylene torch. For larger articles, an open furnace or forge is recommended in order to get an even distribution of heat. Dip or roll the article in HARD-N-TUFF powder . . . that's all. The entire operation takes only a few MINUTES.

HARD-N-TUFF will keep drills, chisels, cutting tools sharper, LONGER—keep machines operating longer, FASTER—cut machine shut-downs for cutting-edge replacements to an unbelievable minimum.

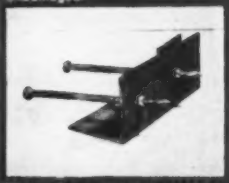
Less costly metals, such as boiler plate, hardened with HARD-N-TUFF and used for dies, drills, punches, cams, jigs, fixtures, pawls, drill bits, cutting and impact tools, will outperform and outlast the more expensive steels generally used for the same operations.

HARD-N-TUFF has gained nation-wide interest, and is used by major steel and manufacturing companies everywhere.

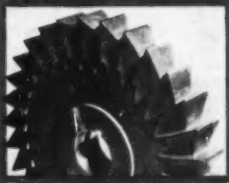
HARD-N-TUFF IS UNCONDITIONALLY GUARANTEED TO INCREASE THE LIFE OF TOOLS AT LEAST 300%, OR YOUR FULL PURCHASE PRICE WILL BE REFUNDED.



This lug bolt was hardened with HARD-N-TUFF and cut threads through holes in this solid steel plate with 12" wrench. Bolt threads were undamaged.



20-d nails treated with HARD-N-TUFF are driven through ¼" hot rolled angle iron and ¼" cold rolled steel. Points and shanks are unaffected.



This milling cutter for steel and iron had to be slowed down to 25% of normal speed. HARD-N-TUFF treated, it worked at full speed.

Chisel formed from ordinary wagon bolt. HARD-N-TUFF treated, cut 1" deep into this ½" angle iron with 4 strokes of 3-lb. hammer.

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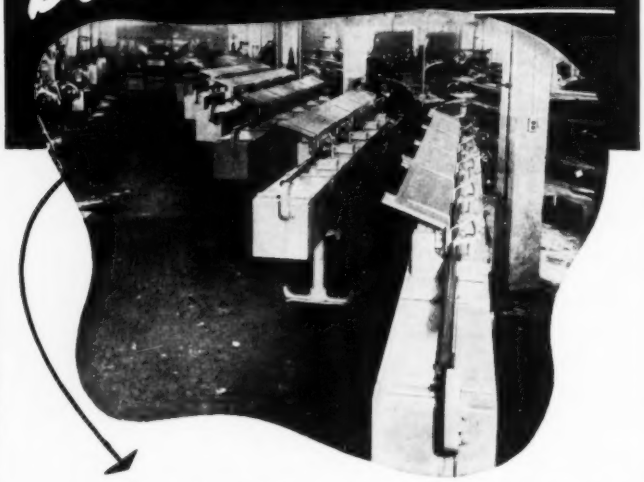
500 Fifth Avenue New York 18, N. Y.

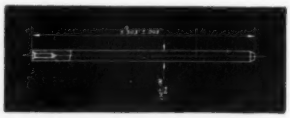
LIPE AUTOMATIC MAGAZINE LOADING BAR FEEDS *Doubled* PRODUCTION!



The machined worm wheel shaft and agitator rod shown below are typical of the many parts turned out on a bank of seven screw machines equipped with Lipe AML Bar Feeds at Hamilton Beach Division, Scovill Mfg. Co., Racine, Wis., manufacturers of food mixers, vacuum cleaners, hair dryers and other motorized appliances.

No lost time in loading and hand feeding! . . . No scratching of high-finish stock! . . . No idle operation of screw machines! . . . Maximum production capacity fully maintained!

Long worm wheel shaft .3125" dia. machined from piston rod finish, cold-drawn steel. When the Lipe AML Bar Feed automatically loaded and fed the stock to a Model 2G B&S, *production increased 100%* over conventional loading operation.



Agitator rod .250" dia. machined from S.A.E. #1112 Bessemer wire. When the Lipe AML Bar Feed automatically loaded and fed the stock to a Model 00G B&S, *production increased 100%* over conventional loading operation.

On job after job there is proof—like these examples from a typical four-week production run—that Lipe Automatic Bar Feeds insure big production gains, BECAUSE:

- **Stock is fed to screw machines all the time . . . not dependent on operator.**
- **Pressure constantly behind stock.**
- **Eliminates feed fingers.**
- **Avoids multiple feed finger feedouts.**
- **Model AML gives maximum output of machine . . . no "cutting air."**
- **Saves changeover set-up time.**

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem . . . no obligation.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

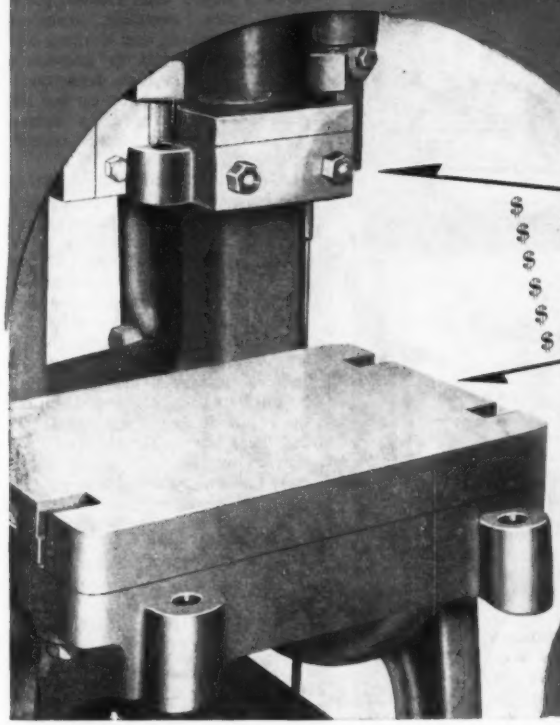
may seem unimportant to the man in the upper brackets of the organization. But to the worker, this delay is vital, and when glossed over by a thoughtless foreman may easily become a rankling sore in the worker's mind. It remains there to fester until removed.

Although the plant may have a grievance committee set up to handle any employee's real or fancied grievance against the foreman or company relative to adjustment of a personnel or wage problem, it is believed that the best grievance plan should start with the foreman. The plan should require workers to start with the foreman on all grievance matters as part of the joint-committee plan. There are many advantages to starting all grievances with the foreman. He knows conditions. He knows his men. He can quickly learn to discriminate between the chronic complainer, the soreheads, the troublemakers, and the sincere worker who has a just and reasonable grievance. If the grievance is a petty, inconsequential detail, unworthy of complaint by a real man, the foreman can laugh it off and make a quick end of it.

But here a real danger presents itself. If the foreman is too successful in "laughing off" the majority of grievances, the grievance procedure, as far as that foreman's department is concerned, is worthless and has broken down. Employees are quick to sense the truth when a foreman forms the habit of attempting to squelch grievances. It makes little difference which method he employs. He can joke and laugh and tease the men out of their grievances, and make himself think he has squelched grievances. Or he can adopt a stern, unbending attitude toward grievances and tell his men that they ought not to complain, that he will "see about it," or bring it up at a future meeting, or that what they ask is impossible. In either case, the result is the same. The grievance procedure is useless.

If the management will make it clear to every foreman that grievances are to be treated seriously, foremen will not attempt to squelch them. Foremen must be taught to anticipate and to expect a certain number of grievances and to settle them fairly and promptly. More than that, they must be taught that grievances are not necessarily a reflection upon the foreman's ability or his skill in handling men. To put it plainly, do not allow a grievance procedure to put the foreman on the spot. Do not let foremen feel that too many grievances will result in

Johnson INCLINABLE POWER PRESSES GIVE YOU 3 TO 8 INCHES MORE IN THE "EARNING SPACE"

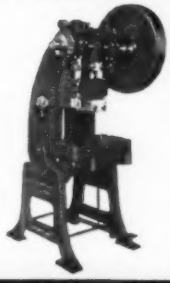


from HERE *to* HERE

BETWEEN the bed and the gibs, in the depth of the standard stroke, you earn spot the earning capacity of a power press. Every standard Johnson model has an advantage over other presses in this respect. In addition to this, Johnson's frame-casting method permits lengthening of the stroke in one-inch increments on special custom-built presses at negligible cost.

YOUR DIE DOLLAR brings a greater return when production is scheduled on a Johnson press. Check the dimensions of competing units, and you'll see Johnson gives you more die space on smaller presses, even though the standard bolster plate is thicker. This advantage is greatest in the Models 1, 2, and 4½.

WITH JOHNSON *INCLINABLES* on the floor, a plant can handle bigger jobs with a small investment in original equipment and lower operating costs. We can send you figures to support purchasing recommendations on open back inclinable power presses of 16 to 90 ton capacity.



EXTRA SAFETY makes Johnson a better buy. Exclusive patented Non-Repeating Safety Clutch prevents accidents and protects dies. Mechanism is activated by two springs. If one breaks, the other holds clutch disengaged. If both should break, clutch automatically disengages. It takes 30 seconds to replace springs —without stopping machine.

RUGGEDLY BUILT

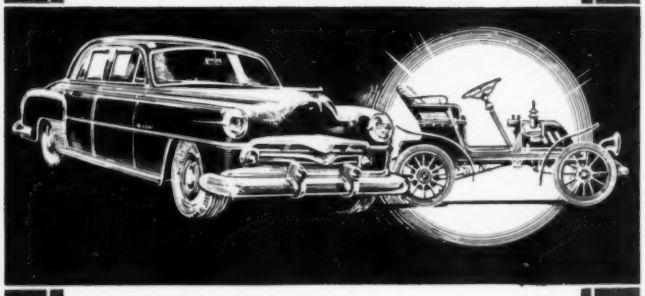
Johnson presses have extra gib adjusting bolts on side of frame, extra front anchor bolts . . . and bigger ones . . . for longer service on heavy work without loss of precision.

Write **or call Johnson for specifications on six models of inclinable power presses now being offered. Tell us what materials you work, how you form them. Chances are a Johnson can do a better job.**

Johnson MACHINE and PRESS CORP.

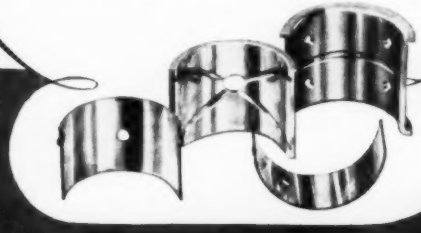
630 WEST INDIANA AVENUE • ELKHART, INDIANA

JOHNSON BEARINGS
1901-1951



We grew up with the Automobile Industry

GROWING UP together, working together for the past fifty years, the automobile builders and Johnson Bronze have made tremendous progress. Engineering cooperation made possible higher compression, higher speeds, and greater durability in automobiles. Such cooperation in many industries has been responsible for new bearing developments—changes in bearing design, new conceptions of precision, refinement of alloys, and new bearing metals. As a result, today's Johnson Sleeve Bearings are the most accurate and the best we have ever produced. The line is complete . . . cast bronze, babbitt lined bronze, babbitt-on-steel, bronze-on-steel, powder metallurgy, and aluminum alloy. We will gladly study your requirements and make recommendations on types and designs of bearings needed. Write today.



SLEEVE BEARING HEADQUARTERS *Since* 1901

Johnson Bronze

525 SOUTH MILL STREET • NEW CASTLE, PA.

a black mark aganist them, for if they do feel this way they will find a method of squelching grievances.

Some management officers who have studied grievance plans believe that foremen should settle 95% of all grievances. This may be a rather high percentage in shop plants, especially where time studies, piecework rates, overtime, transfers, working methods, and working conditions are subject to grievances. Periodical checkups on departments where grievances come up too seldom are necessary as a control measure, for a reasonable number of grievances is healthy.

A grievance committee made up of representatives of management and employees seems to be a good way of handling employee grievances, rather than through a personnel man. By such means, employees are assured that their complaints will receive attention, and management is spared the inefficiency of dissatisfied employees. In most instances, grievances may be settled easily. Many of them are the result of simple misunderstanding. They become serious only when they are neglected. Obviously, therefore, the wise practice will provide means that assure their immediate recognition and speedy settlement. The management-worker grievance committee is the soundest method for dealing with this problem.

Harry Kaufman
Philadelphia, Pa.

•

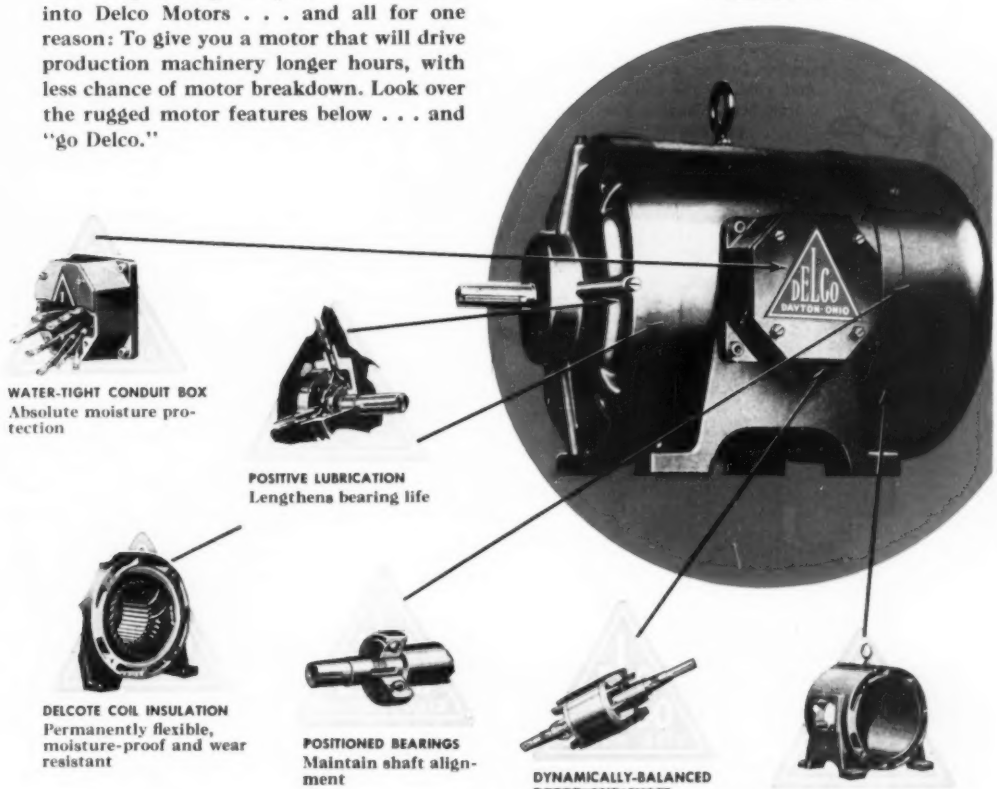
A LABOR-MANAGEMENT COMMITTEE can be a very useful means of settling differences before they reach the boiling point. The catch usually is that they don't work because management attempts to direct the committee. The establishment of such a group to study general personnel problems, working conditions, and similar phases that affect the major portion of the employees must be based on the equal division of seats between labor and management with the chairmanship rotating between labor and management. Men on such a committee should be rotated every two months allowing more of a varied group of both sections of our industrial world to take part.

When should a question come before the committee? Not until the employee has attempted to correct the conditions by discussing it with his shop steward and his immediate supervisor. If settlement of the problem can not be handled at that point or if the committee ruling is desired to clarify all future prob-

GO DELCO...

give motor trouble the BRUSH OFF

Delco engineering has put a lot of extras into Delco Motors . . . and all for one reason: To give you a motor that will drive production machinery longer hours, with less chance of motor breakdown. Look over the rugged motor features below . . . and "go Delco."



WATER-TIGHT CONDUIT BOX
Absolute moisture protection

POSITIVE LUBRICATION
Lengthens bearing life

DELCOTE COIL INSULATION
Permanently flexible, moisture-proof and wear resistant

POSITIONED BEARINGS
Maintain shaft alignment

DYNAMICALLY-BALANCED ROTOR AND SHAFT ASSEMBLY
Reduces vibration, wear

CORROSIVE-RESISTANT CAST IRON FRAME
More solid, more rugged

"DELCO PREFERRED"
—because Delco Delivers

Open and enclosed motors for most industrial applications in sizes up to 100 horsepower for standard foot mountings. NEMA C&D flange-mounted motors available in sizes through 30 horsepower. Get in touch with Delco Products, Dayton, Ohio . . . or any sales office listed below.

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DELCO MOTORS

DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

SALES OFFICES: Chicago • Cincinnati • Cleveland • Dallas • Detroit • Hartford • Philadelphia • St. Louis

ALSO AVAILABLE THROUGH DELCO MOTOR DISTRIBUTORS

Tiny holes? . . . . . Easy!

Accurate holes? . . . . . Easy!

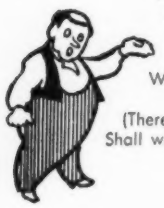
Holes on production schedules? . . . . . Easy!

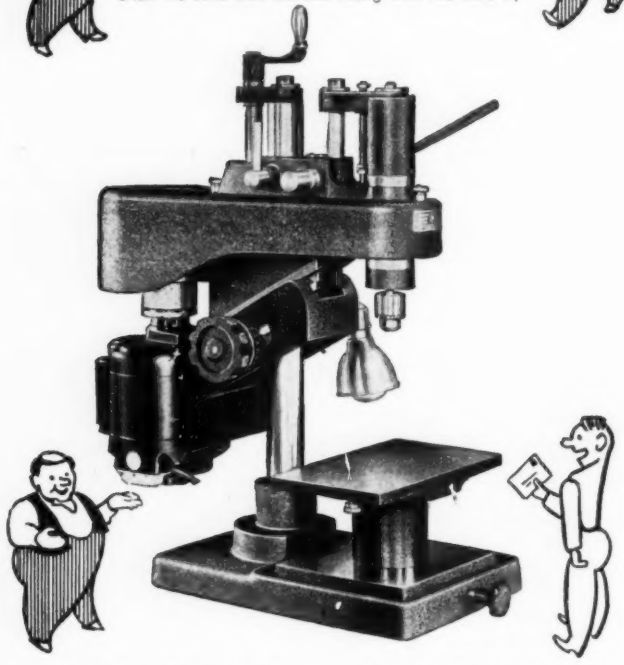
Tiny, accurate holes on production schedules? . . . WOW!

Hamilton Drilling Machines can do it!
And withdraw the drill undamaged
from hole after hole after hole!

LEARN HOW!

Write for the series of Hamilton Drilling
Machine Bulletins and Price Lists.
(There is also a companion Tapping Machine.
Shall we send that bulletin along with the others?)





Shown here is the Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole Drilling Machine, one of four models, each particularly adapted to the work for which intended, all equally precise.

THE *Hamilton* TOOL COMPANY
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

lems of such a type, then it will be forwarded to the committee in writing with a request for a hearing on the problem. The committee then acts as a court and listens to both sides and develops a ruling which will govern all future handling of such problems regardless of where they come up in the plant.

It would appear that the problem facing Ed was one of a not too clear picture in his own mind of just what the labor-management committee was supposed to do in his plant. Unfortunately this condition too often exists within many companies. Committees are formed, new policies are placed into effect, changes of work-loads are made without proper explanation to the operating supervisors and so on. Oh yes, a notice was sent out but no meeting of supervisors was called to discuss the idea and make certain that it was clearly understood. To management this is often too much trouble and their attitude is "why bother with the foremen, they have to take our orders and like it." But while the orders are carried out so is the efficiency undermined. Restlessness of supervisory staff is caused and this results in losses to the company in both time and profits.

Management still has much to do to improve supervisory relationships. It is the relationship that can reduce labor problems. The better the foreman is informed as to policies and the better he understands them, the better he can handle the daily problems that occur with his workers. The more efficiently the problems are handled, the better the plant efficiency that can be obtained.

Yes, labor-management com-

"Remember how years ago you could tell exactly what a new machine was without looking at the name plate?"

CHECK THREAD ACCURACY, ASSEMBLE-ABILITY *Visually*

WITH THE H-W *Dual* THREAD COMPARATOR

As a companion to our Standard Thread Comparator, Hanson-Whitney now introduces the DUAL Unit. A new anvil design consists of two threaded "holes" or gaging positions that give the inspector 100% more accurate check of external threads.

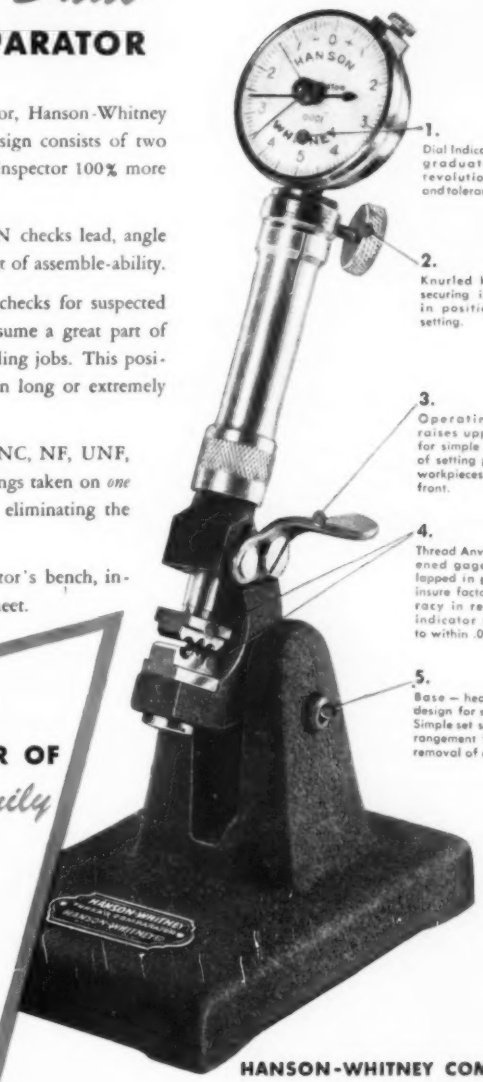
1. FULL THREADED GAGING POSITION checks lead, angle and pitch diameter cumulatively for accurate test of assemble-ability.

2. 2-THREAD GAGING POSITION spot checks for suspected lead and angle errors which could easily consume a great part of pitch diameter tolerance on close fitting threading jobs. This position will also detect pitch diameter taper on long or extremely short thread lengths.

Three unit sizes available for checking NC, UNC, NF, UNF, and NS threads up to 1½" diameter. All readings taken on *one* dial indicator to accepted ring gage tolerances, eliminating the human error-possibility of "feel."

For fast, precise gaging at machine or on inspector's bench, investigate the DUAL. Ask for detailed Data Sheet.

A NEW MEMBER OF *the family*



1. Dial Indicator, .0001 graduation with revolution counter and tolerance hands.

2. Knurled knob for securing indicator in position after setting.

3. Operating Lever raises upper anvil for simple insertion of setting plug and workpieces from the front.

4. Thread Anvils hardened gage steel, lapped in place to insure factory accuracy in recording indicator readings to within .0002".

5. Base — heavy duty design for stability. Simple set screw arrangement for easy removal of unit.

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to get the fastest, easiest metal-cutting – tell your supplier you want VICTOR hand and power hack-saw blades and flexible-back band saws.

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Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

mittees properly organized can help the foreman. Personnel departments can also give considerable aid to the foreman by reducing his load when dealing with prospects for jobs. But whether these two ideas will really work rests with top management in explaining and outlining their functions to the lower supervisory personnel and letting them have a hand in making the decisions of how the new plans could best operate to help them most.

Charles D. Townsend
West Hartford, Conn.

•

SPARE THE ROD

IT IS REASONABLE to expect better results when surroundings are improved and in most cases people obtain a feeling of comfort, appreciation and encouragement which does bring better results.

When an employer does something to make things easier and more pleasant for workers, although some may doubt for a time as to his motives, that doubt will soon wear off and be supplanted by a feeling more liberal and the worker will show his appreciation by revival of interest in his work. That the change has been noticed will be evidenced by the quality of their work and production which may speak louder than words.

John Mark May
Watervliet, N. Y.

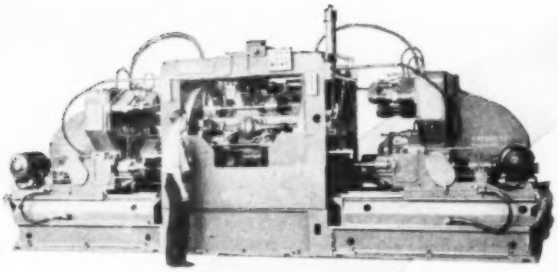
•

MEETING production schedules economically is the objective of all manufacturing organizations. Some plants may have to use a firm but fair approach, while others may accomplish their objective with a policy of ease.

Which plan is used is dependent upon the type of leadership characteristic of the organization. Furthermore a great deal depends on the important function of shop supervision. Policies as they are formulated are only as good as the foremen who administer them.

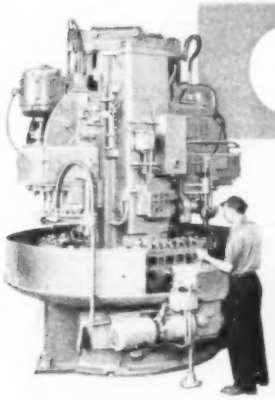
There is such a thing called normal shop discipline. A shop cannot operate successfully without it. In order to maintain normal shop discipline there must be a set of rules. Just how rigid these rules must be is dependent upon the degree of loyalty and confidence that has been built up in the employees. Developing employee loyalty in large organizations may be more difficult to achieve than in a small shop, however such a condition is possible.

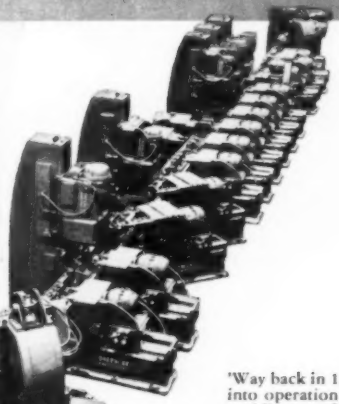
In the small plant, the relation-

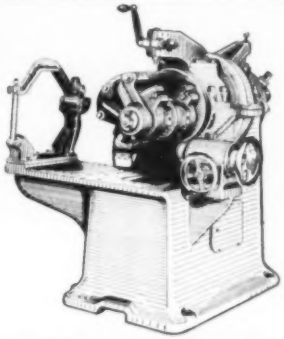


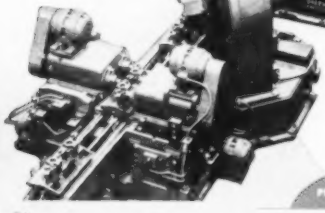
BUILDERS OF SPECIAL MACHINERY SINCE 1918

GREENLEE







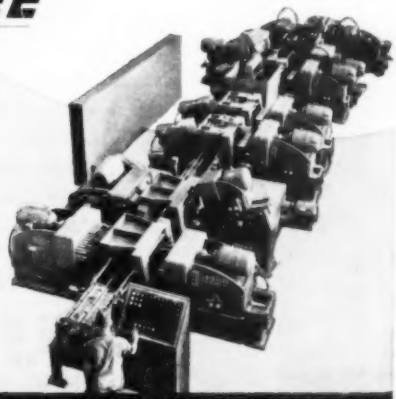


'Way back in 1918, the first Greenlee Special Machine went into operation in the tractor plant of a now famous automobile manufacturer (who still makes tractors). We've made a lot of machines since then, from small, special purpose machines performing only a few operations to huge transfer machines employing several hundred tools working in automatic, unvarying cycles. We're still making special machines . . . and constantly developing new methods for faster, cheaper production processes.

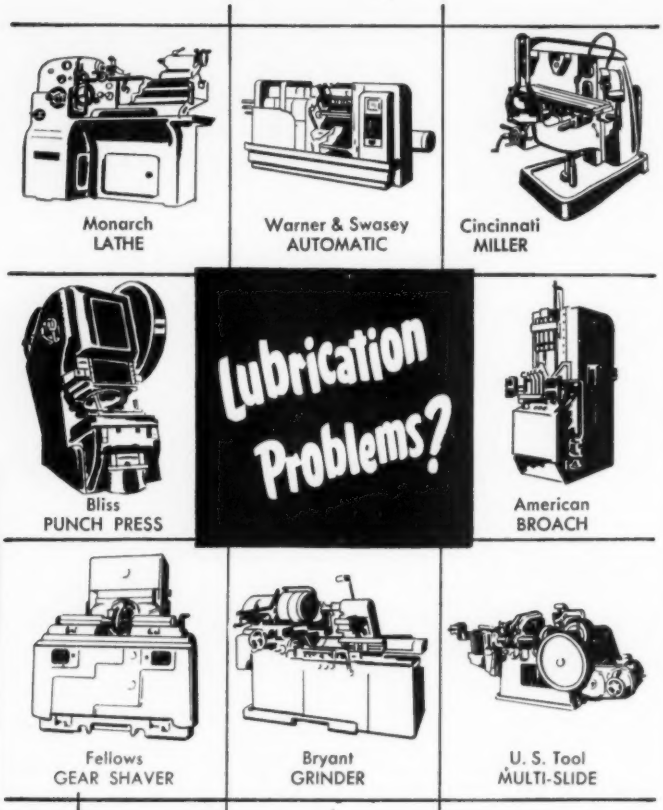
PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO.,
1730 MASON AVE., ROCKFORD, ILL.



MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



not on these machines!

...they're all BIJUR equipped

Every one of these machines is designed for continuous production. This is made possible by the built-in Bijur lubricating system. It oils the machine during operation and reduces bearing wear by controlling oil feed *at the bearings*. In both cases, it converts down-time for maintenance into more time for production. When you buy a Bijur-lubricated machine, you're assured of built-in bearing protection.

754

Write for Bulletin MW

BIJUR

LUBRICATING CORPORATION

Rochelle Park • New Jersey

ship or contact between top management and employees is closer. Since such conditions exist, policies must be tailored in accordance with the size of the plant.

Performance and responsibilities are closely related. In sound organization every individual from top management down to the individual employee must be fixed with definite responsibilities. If such responsibilities are being fulfilled, factory performance or output is generally good.

There is a distinction between humanized shop conditions and laxity in shop operations. Good performance can be the result of human shop conditions and you certainly cannot have good performances by allowing a policy of laxity to exist.

Peter L. Budwitz
New Britain, Conn.

NEW BOOKS

OSAKA TRADE INDEX—*Published by Osaka Foreign Trade Institute, Osaka, Japan.*

Printed in English, and including a Japanese-English vocabulary for company names and addresses in the index, the book contains a main list of Osaka export-import, commercial, and manufacturing companies; an index to commodity groups, and an index of products. As valuable as any local manufacturing directory, the reference is well organized and is easy to use, despite the language barrier. One interesting advantage is that the bank usually utilized by a given company in monetary exchange is listed.

A reference list of business institutions related to trade includes banks, shipping companies, hotels, and government agencies.

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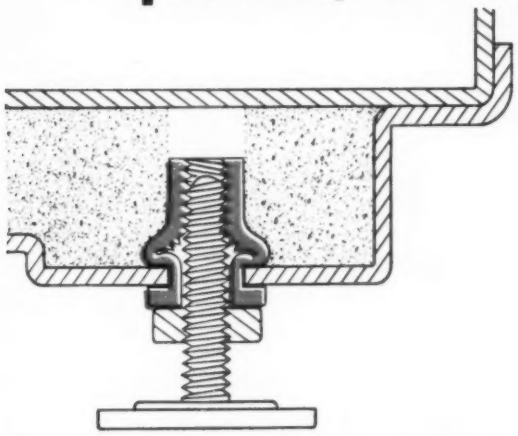
ORDNANCE PRODUCTION METHODS—*Edited by Charles O. Herb. Published by The Industrial Press, 148 Lafayette St., New York 13, N.Y. 534 pages. Price $10.*

This book is a collection of articles published in *Machinery chiefly* during World War II and describing manufacturing operations employed for the production of shells, machine guns, and other military equipment. It is intended to assist manufacturers in setting up for cur-

RIVNUTS solve refrigerator fastening problem, cut assembly costs



REFRIGERATOR designers had a puzzler on their hands in finding a way to fasten leveling feet to the cabinet. The metal was too thin to tap, and welding would warp it. Besides, the threads would be ruined in the enameling process.

All these problems were solved by a B. F. Goodrich Rivnut—the *only* one-piece blind rivet with threads! Working from one side of the cabinet, one man installs the Rivnut in a few seconds. The easy-to-use power heading tool forms a bulge in the Rivnut shank—a "second head" that tightly grips the material. At least six threads remain clean to take the leveling-foot screw. Installation is made *after* enameling without marring the finish.

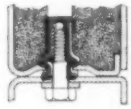
Besides these advantages, the quick, simple installation of Rivnuts saves time, cuts assembly costs. For help on your fastening problem, write The B. F. Goodrich Company, Dept. AM-101, Akron, Ohio.

What's your toughest fastening problem?

TORQUE?

Special Rivnuts with splined shafts or key (above) supply needed torque resistance.

SEAL?



Firm grip of upset Rivnut on material, plus special closed end, gives tight seal.

MATERIAL?

Even in thin materials, Rivnuts provide at least 6 threads for attachment.

ATTACHMENT?

Fasten *with* Rivnuts—fasten *to* Rivnuts. Makes possible multiple fastening.

FINISH?

Rivnuts can be installed after paint or porcelain finish is applied.

LOAD?

Typical Rivnut thread strength: 6-32—964 lbs.; 8-32—1096 lbs.; 10-32—1326 lbs.*

RIVNUTS *lick them all!*

**Figures given for aluminum. Loads for brass and steel Rivnuts about double.*

B.F.Goodrich

RIVNUTS

The only one-piece blind rivet with threads

SEND NOW FOR FREE RIVNUT DEMONSTRATOR

Shows with motion how Rivnuts work. Explains construction, gives proved applications. Write to The B. F. Goodrich Company, Dept. AM-101, Akron, Ohio.

Just Part of ONE
BIG HARDWORKING FAMILY
for INCREASED PRODUCTION!
LESS TOOL COST!
GREATER ACCURACY!
W-S LATHE BITS
W-S REAMERS
W-S END MILLS
W-S TWIST DRILLS
W-S COUNTERBORES
W-S LATHE CENTERS
W-S TOOL BITS, MILLED AND BRAZED
W-S SHELL END MILLS
THE MOST COMPLETE LINE OF CARBIDE CUTTING TOOLS
Choose from a complete range of sizes . . . wide selection of styles . . . straight or taper shanks. Quick delivery on all W-S tools from your nearest Wendt-Sonis distributor.
FREE!
SEND TODAY for CARBIDE EQUIVALENT CHART, showing carbide manufacturers' grade recommendations.
WENDT SONIS
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CARBIDE TIPPED CUTTING TOOLS
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS
CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS
TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER
TURNING TOOLS • SPECIAL TOOLS

rent defense production, as many of the basic methods of World War II are applicable to military items being ordered at the present time.

Articles are nicely grouped by subject for convenience of the reader. In general, the type of equipment employed is pictured and the operation sequence is described. A number of tool and part drawings also are included. Major sections are: small arms ammunition; shells; shell fuses and boosters; cartridge cases and cartridge tanks; bombs, rockets, and torpedoes; machine guns and small arms; artillery, anti-aircraft, and naval guns; gun mounts; tanks, gun bogies, and limbers; and general ordnance manufacturing.

•

TIMESTUDY FUNDAMENTALS FOR FOREMEN *(2nd Edition)—By Phil Carroll, professional engineer. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N.Y. 209 pages. Price $3.*

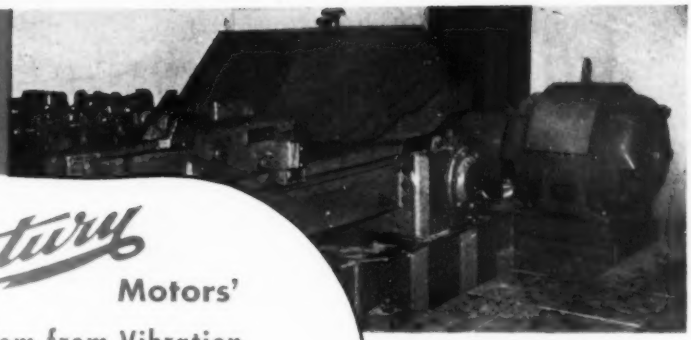
Many foremen today must understand the principles of timestudy to discharge their responsibilities properly. Knowledge of the subject also will benefit them personally through increasing their awareness of opportunities for improvements within their departments. To give the foreman the basic information he needs is the purpose of Phil Carroll's easy-to-read book. Written from an entirely practical point of view, it answers many of the questions that come up regarding time study and incentives in the day-to-day operation of the shop. In addition, it explains important details of the procedure such as making a study, rating the performance, establishing standards, operating the incentive plan, and so on.

•

VOCATIONAL PREPARATION AND INFORMATION MANUAL. *Edited by H. E. Linsley. Published by The Herbert D. Hall Foundation, 99 Lincoln Park, Newark 5, N.J. 231 pages. Price $4.*

Embodying a new concept in the field of vocational education, namely the complete interdependence of school and industry, this unusual book is designed to bridge the gap that presently exists between the training ground—the school, and the field of application—industry.

Industrial employers generally agree that the American public-school system has failed to provide them with employees who have any



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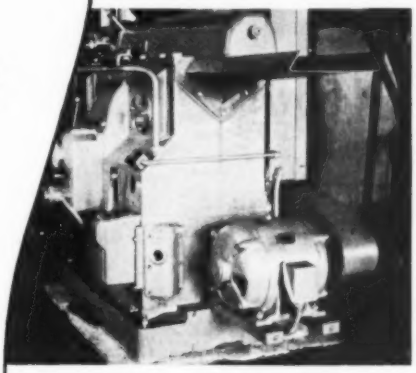
75 Horsepower Century drip proof motor on a copper tube drawing machine.



7½ Horsepower Century drip proof motor on a crank shaper in a tool room.

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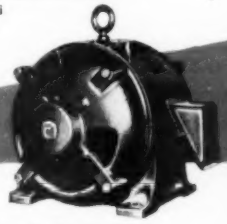

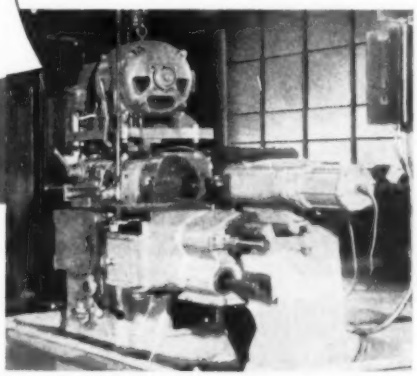

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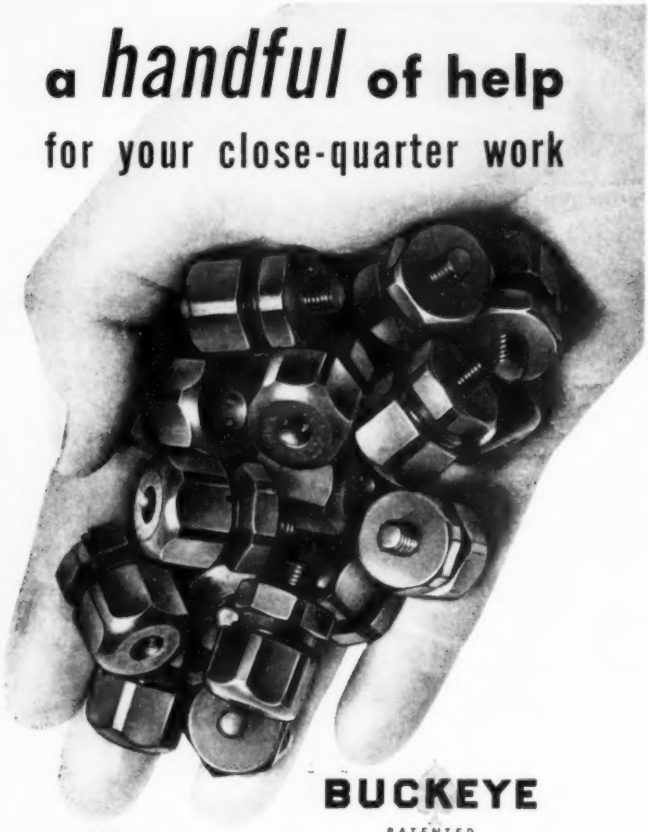

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idea as to what industry is, how it operates, why it succeeds, and what opportunities it offers. The schools, on the other hand, have a legitimate complaint that industry has failed to keep them advised as to what it requires and how they should impart the necessary training.

In this book, designed for the average high-school student who will probably find his life's work in industry, there is put together, for the first time, a comprehensive program for preparing youth for industrial life, for showing what opportunities exist and how to prepare for them.

A teacher's guide, for use in preparing classroom work in connection with this manual, is also available.

•

DESIGN OF MACHINE MEMBERS (3RD EDITION)—*By Alex. Vallance and Venton Levy Doughtie, professor of mechanical engineering, University of Texas. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 500 pages. Price $6.*

A basic text for the design of machine elements, this book has been revised to bring its subject matter up to date. New material has been added on stresses, riveting, gearing, hoisting, and power chain. Numerous discussions have been expanded, including those on eccentric loading, columns, and engineering materials. This book is intended not only for teaching purposes but also as a reference for designers in industry.

•

TECHNIQUE OF ADMINISTRATION (2ND EDITION)—*By Erwin Haskell Schell, professor in charge of the Dept. of Business & Engineering Administration, Massachusetts Institute of Technology. Published by The McGraw-Hill Book Company, 330 W. 42nd St., New York 18, N.Y. 363 pages. Price $4.50.*

Business executives undertaking new responsibilities of an administrative nature will obtain considerable guidance for their thinking and a fuller appreciation of the many factors involved in administration from Prof. Schell's book. Much of the material is based upon the author's long experience in training men for business administration and his personal contacts with many industrialists who have discussed their problems and techniques with him. As a result, this book represents

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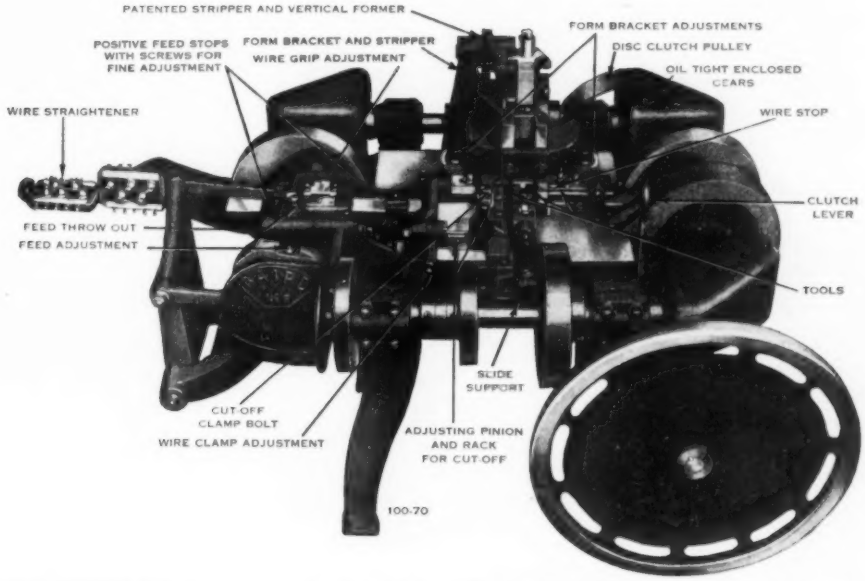

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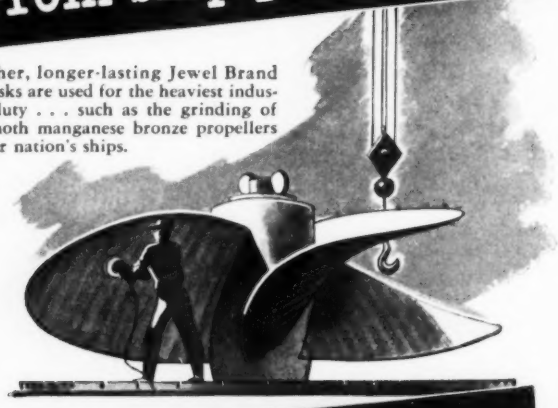

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Throughout the book, many situations are presented and questions asked to stimulate thinking. Not only one already in administrative work, but also those preparing for it, and those conducting seminars and training programs for such groups, can read this book to advantage.

•

ALMOST SINUSOIDAL OSCILLATIONS IN NONLINEAR SYSTEMS—*By Johannes S. Schaffner, Research Assistant Professor, University of Illinois. Published by University of Illinois, Urbana, Ill. 64 pages. Price $.60.*

This is the introductory bulletin of a series of three on oscillatory phenomena in electrical circuits. Dealing with simultaneous oscillations, it covers nonlinear mechanics and circuits, operational calculus, approximations, and linearization.

The material is not on the practical engineering level for radio and industrial-electronics work, but is of research character. It is suggested as reference and educational material for electronics engineers in the design field.

•

CLEAR WRITING FOR EASY READING. *By Norman G. Shidle, editor, SAE Journal. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 176 pages, 5½ x 8¼ in. Price $3.*

Reports, memoranda, letters, and articles will all be benefited by study of this book, a handbook of suggestions for the layman and student writer, not a grammar nor a lexicon. Mr. Shidle deals principally with the problems of getting ideas off a written page into the reader's mind. This is an "example" book which itself exemplifies the principles it presents.

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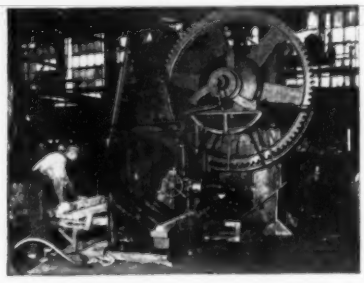
At right, rear view of "Buffalo" No. 15 Billet Shear cutting round cornered squares at a famous automobile plant. Here again, note the clean, square cuts.



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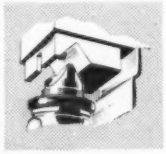

- THE RIGHT HOLD - THE BEST HOLD for work part while drilling hole.
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- THE MOST ACCURATE location of hole in the part.
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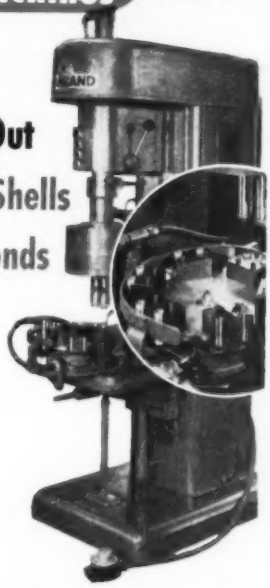

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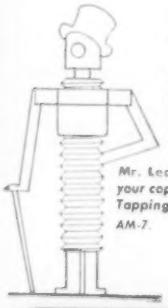

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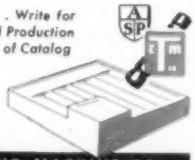

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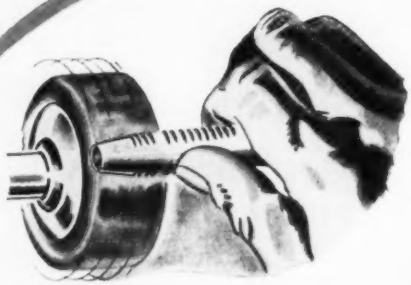

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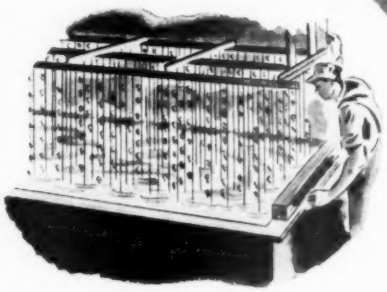

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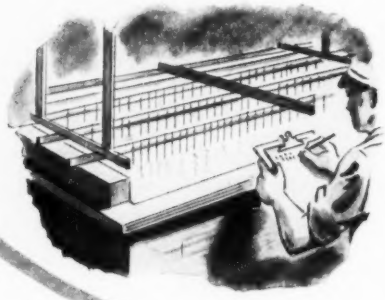

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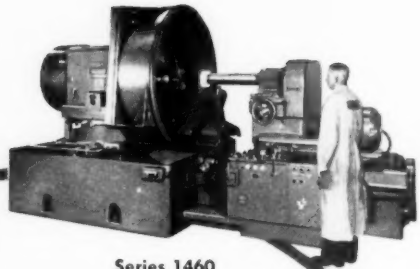

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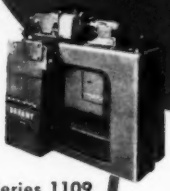

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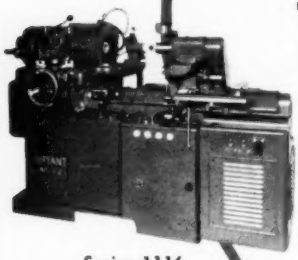
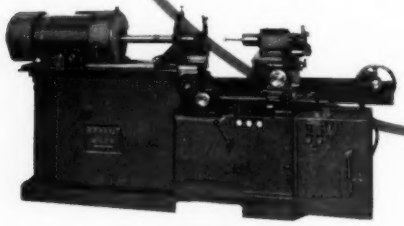


Series 1116

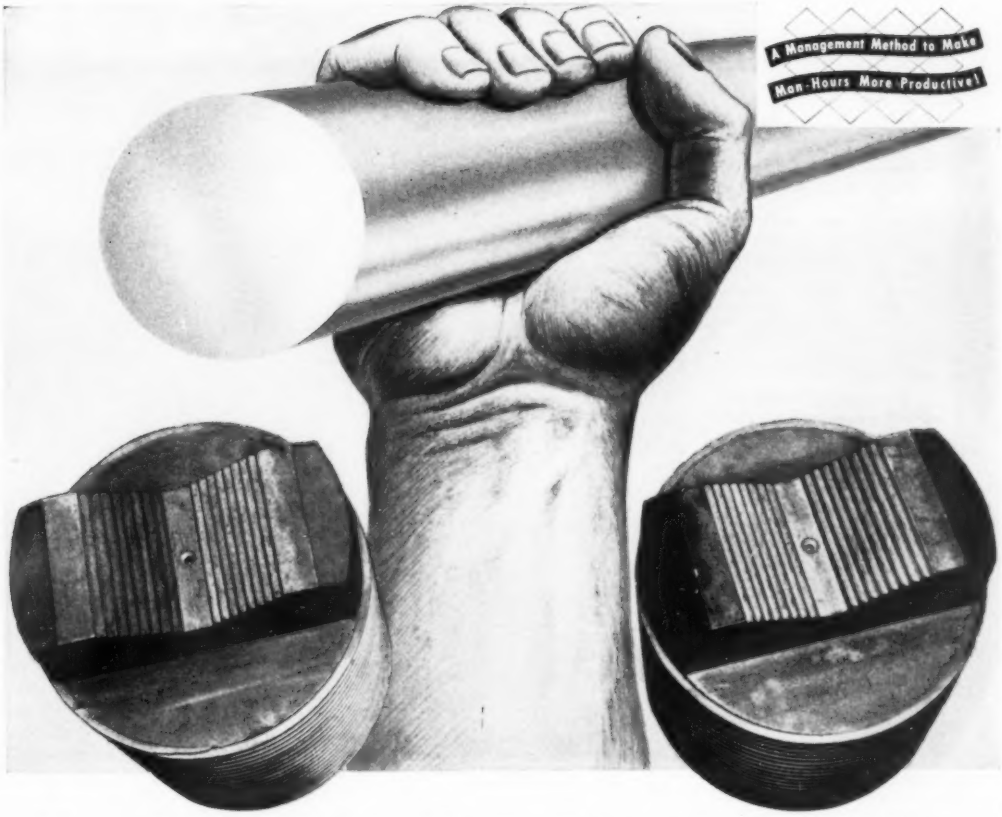
BRYANT has designed and built precision internal grinders for 38 years. Today, their completely modern line covers the grinding of holes from .040" to 50" in diameter. Standard and special machines will grind straight, tapered, curved and irregular holes, or any of these in combination. Face and hole grinding can be combined to assure squareness. Cams and irregular holes can be ground by using the cam attachment. The Series 1460 has a face plate 60" in diameter and will swing work up to 50". A special machine will take 100" swing. The Series 1109 is equipped with Bryant High Frequency wheelheads giving speeds up to 100,000 R.P.M. for extremely small bores. Maximum swing of the 1109 is 9". Series 1116 machines are for general purpose tool room work. They incorporate many quick-changeover features and will swing 16". The 1416 machines are similar to the 1116, but have provision for grinding long bores such as machine tool spindles. Series 1216 grinders are completely automatic and will grind bores from 5/16" to 6" in diameter. The High Frequency head is [illegible] used on the 1216 for maximum efficiency on small bores. All these machines incorporate the exclusive Bryant feature of hardened and ground cylindrical slide construction and three-point bearing. Complete specifications are available on all Bryant precision internal grinders — write today.



Series 1416

Series 1216

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.



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These giant jaws, made from Vega (Air-Tough) Tool Steel, grip 13½" round steel billets during rough turning in the largest machine of its type. Steady, uninterrupted production in the operation depended largely on quickly finding the right tool steel.

The company had been using an oil-hardening steel for jaws in normal-sized machines. But when the new giant came along it was a different story. Now a steel was needed that would harden uniformly, and *through very heavy sections*. By using the Carpenter Matched Set Method, the company was right the first time in selecting Vega . . . and saved costly experimenting with different tool steels. More important, production management was able to put the jaws in operation, knowing they could depend upon heavy production schedules being maintained.

This workable Method offers your plant more advantages than accurate, simplified tool steel selection. It can help you make machine operators more productive. It can do a lot to make heat treating a "routine", trouble-free procedure. It can hold your tool steel inventories to a minimum. Find out how, why and where it can work for you. Write for the new booklet "How to Get Better Tool and Die Performance". THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

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Memo to mechanics

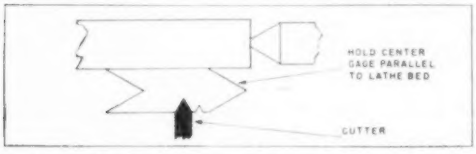
How to do it right with WILLIAMS THREADING TOOLS

FOR EXTERNAL THREADING

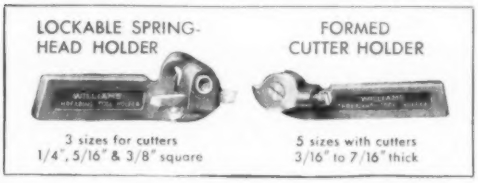
Thread cutting in the engine lathe requires a thorough knowledge of change gear principles and procedure. However, the quality of the final job depends upon the cutting tool itself. The proper application of two types of Williams Threading Tool Holders is described.

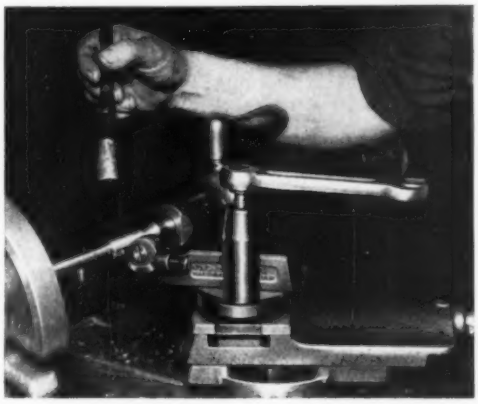
The Spring-Head type is designed for both fine and coarse threading. Its Spring Head is equipped with a Locking Nut which provides the rigid backing required for heavy cuts; when loosened, the Holder becomes a Spring Tool for finishing work. Finished High Speed Steel cutters are furnished with this tool having each end ground to a "V" point forming an angle of 60°.

To set the Tool, first adjust the cutter so that only the ground portion projects beyond the Holder. Now set the Holder in the Tool Post, adjusting the cutter point vertically to exact center of the work. Then place a Center Gage with its back edge in contact with the



work, or the Tailstock Spindle, and adjust the Tool horizontally by fitting the cutter point *exactly* into the 60° angle notch in the front edge of the Center Gage (see illustration). Tighten the Tool Post Screw, using caution not to change position of the Holder. Apply cutting oil to the work generously when threading steel.

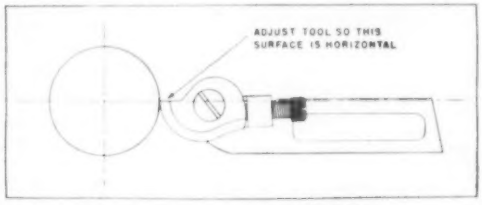

LOCKABLE SPRING-HEAD HOLDER
FORMED CUTTER HOLDER
3 sizes for cutters 1/4", 5/16" & 3/8" square
5 sizes with cutters 3/16" to 7/16" thick



Williams Formed-Cutter Holder has a cutter ground to an included angle of 60° and backed off for correct clearance. In regrinding, the top edge only is ground, thus assuring a point of proper form and angle as originally supplied.

Procedure in setting this tool is the same as explained for the Spring-Head Tool. In adjusting height of Tool so as to center on the work, do not use the Stop Screw on the side of Holder. This adjustment is used to compensate for metal removed from the cutting point in regrinding. The top surface of the cutting point must always be horizontal when threading (see illustration).

Copies of this and other "Memos to Mechanics" are available free upon request.



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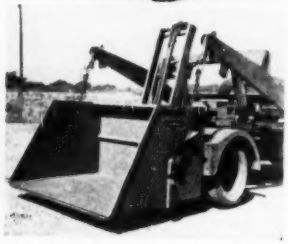

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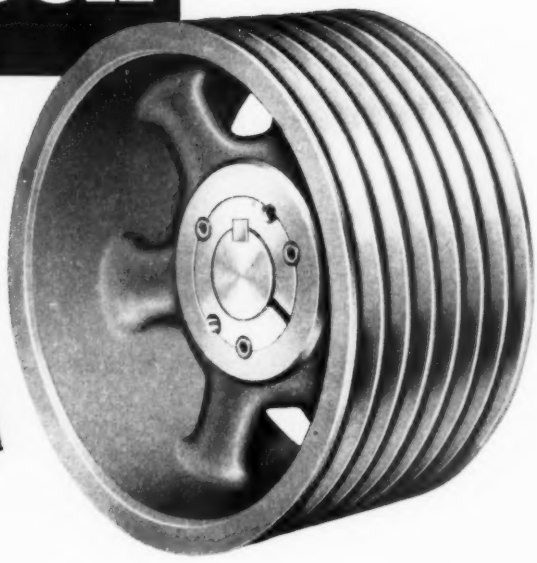

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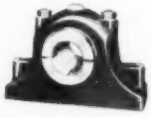

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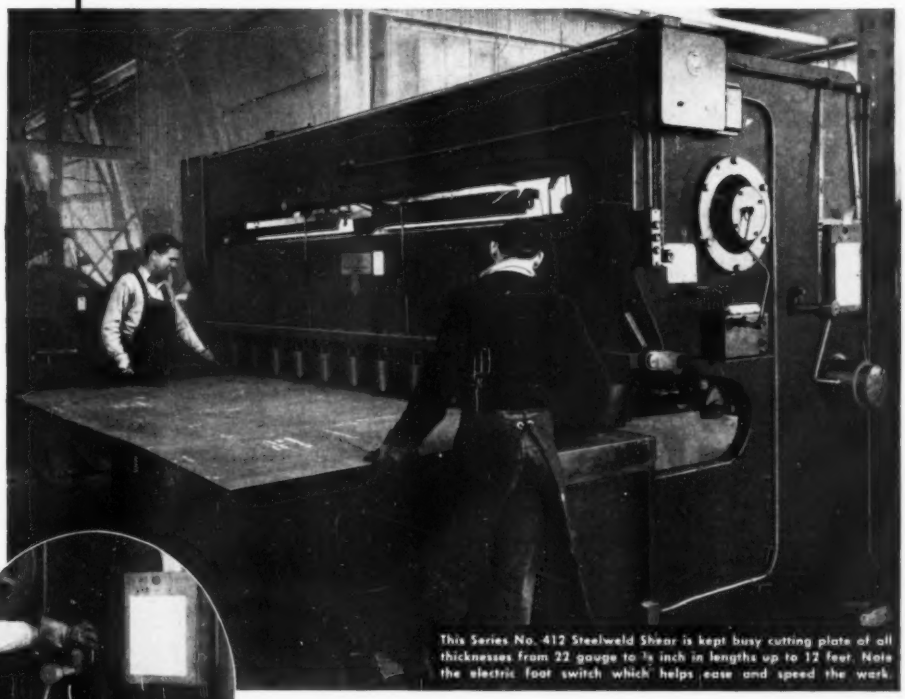
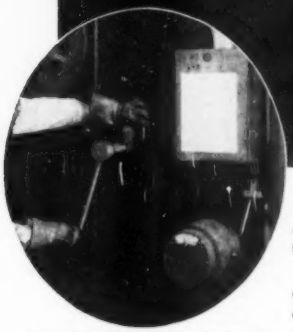
KNIVES STAY SHARP LONGER for California Steelweld Shear User



This Series No. 412 Steelweld Shear is kept busy cutting plate of all thicknesses from 22 gauge to ½ inch in lengths up to 12 feet. Note the electric foot switch which helps ease and speed the work.



One of the big reasons why knives stay sharp longer on Steelweld Shears is the simplicity with which knife clearance can be adjusted for every plate thickness. It's merely a matter of turning a hand crank until the gauge pointer is on the proper figure. No bolts to loosen. No need of a feeler gauge.

"It's a shame," said the shop foreman at Stephens-Adamson Mfg. Co., Los Angeles, California, "but since installing our Steelweld Shear the knife-sharpening man has been crying because we have no work for him."

After months of continuous operation, eight hours a day, usually six days a week, inspection of cut pieces indicates the knives are practically as sharp as new. Parts cut have no burrs and are straight and true. Even when the cutting edges of the knives finally become dulled, there are three more cutting edges ready for use as all four corners of each knife are prepared for shearing.

Stephens-Adamson like their Steelweld Shear and are happy over its operation. It plays an important role in the manufacture of screens, elevators and conveyors which are the principal products of this large West-coast plant. In their words, it is "heavy, well built and dependable. We know it is reliable and always ready to handle our work from day to day."

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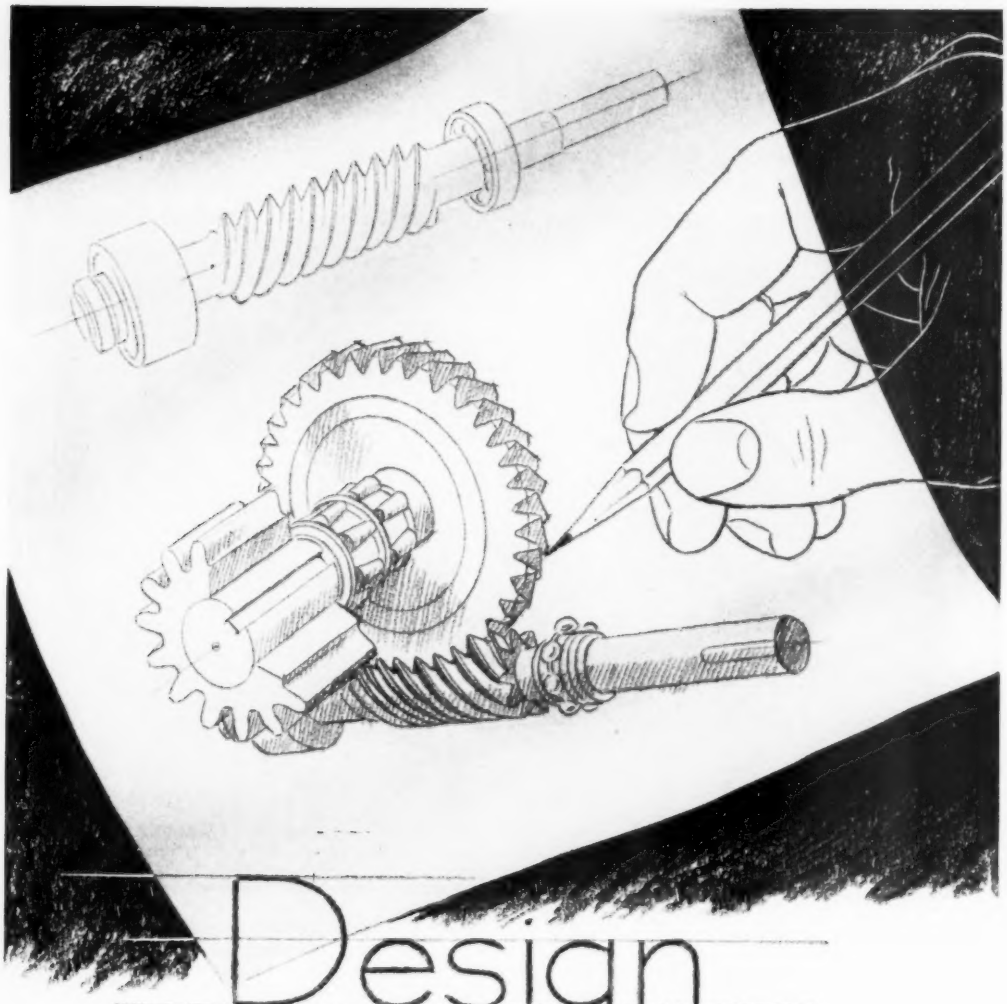

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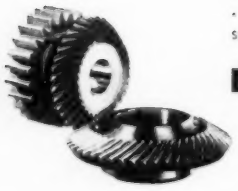

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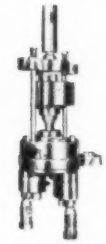

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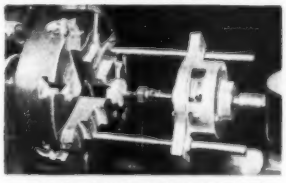

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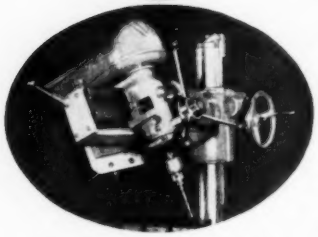

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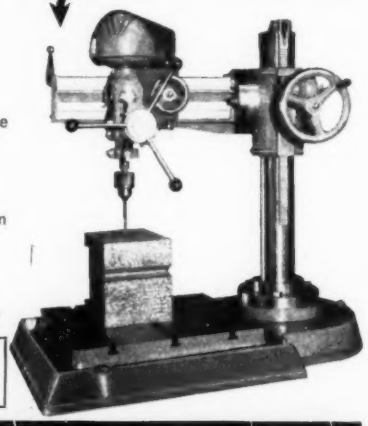

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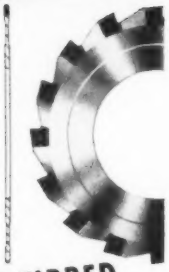

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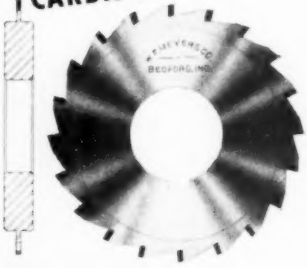

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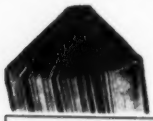

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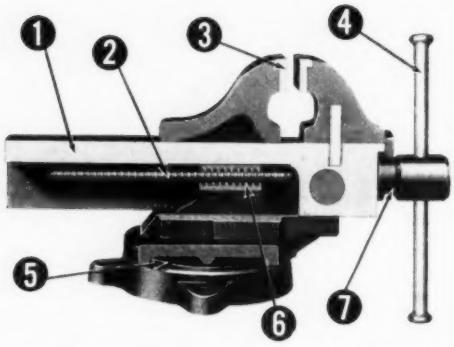

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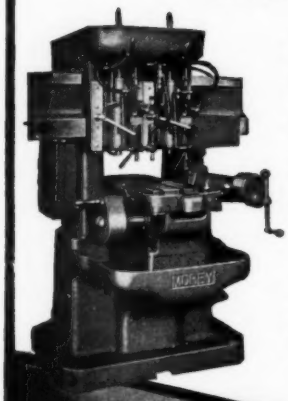

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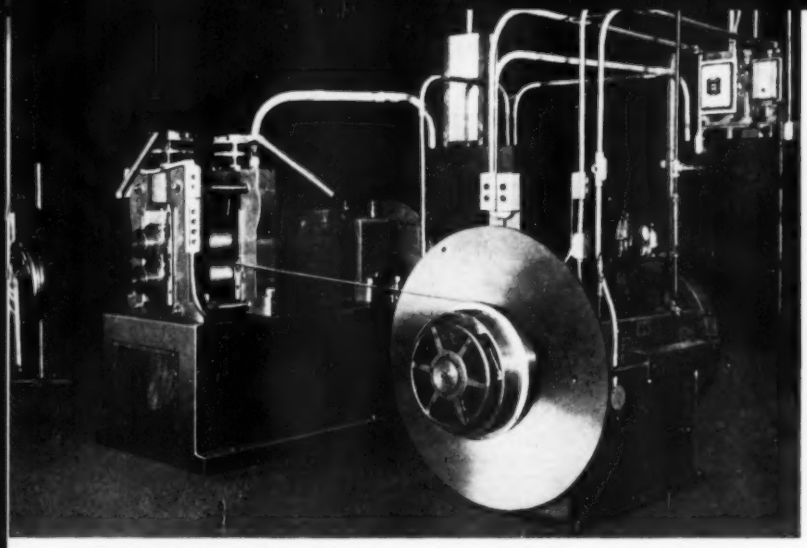
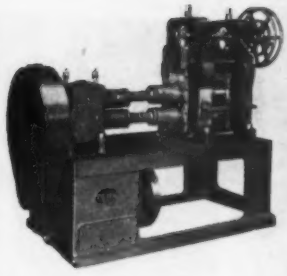


THIS FENN COMBINATION, consisting of the new No. 061 Two-High Roller Bearing Rolling Mill and No. 30 Take-Up Reel, installed at Federal-Mogul's St. Johns, Michigan Plant...



GREATER ACCURACY of the new No. 061 Two-High Rolling Mill comes from heavier roll construction made possible by Fenn-designed extra-heavy precision roller bearings. Roller thrust bearings on outer bearing boxes maintain axial alignment, eliminating marks or "shadows" on the stock. Universal joint and herringbone gears provide smoother drive from motor through to rolls, for smoother finish of strip.

Reduces Inventory...Saves Maintenance

...CUTS COSTS

Federal-Mogul is one of the growing number of forward-looking firms that are making sure of an adequate supply of top-quality strip by "rolling their own."

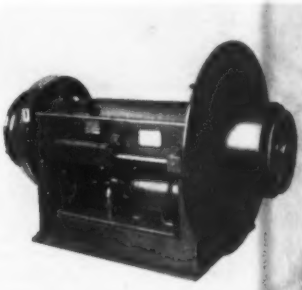
This way, they roll one stock thickness to meet many needs, thus reducing stock inventory . . . the more accurate strip they produce speeds production and saves maintenance on fabricating machines . . . and there's further economy in eliminating such "mill extras" as set-up, inspection and short run lots.

To get these benefits at their fullest, Fenn units are the obvious choice. The installation shown above, for example, is one of many typical Fenn combinations for the production of ferrous or non-ferrous strip—at top speed and lowest cost.

GET THE WHOLE STORY

Fenn Roller Bearing Rolling Mills are available in Two-High and Four-High models, with roll diameters from 4" to 16", single or tandem units, speeds up to 2,000 ft. per min. Fenn Take-Up Reels are made in a range of sizes for either traversing or "pancake" winds. For, full information about their many cost-saving, efficiency-boosting advantages, contact your nearest Fenn Distributor, or write direct to

THE FENN MANUFACTURING COMPANY
1859 Broad St., Hartford 1, Connecticut



FASTER REMOVAL of finished coil is one big advantage of Fenn's No. 30 Take-Up Reel — resulting from such design-improvements as collapsing drum and hydraulic stripper. Having a capacity of 3,000 lbs. of coil, while providing a tension of 2,500 lbs., it combines with the Fenn Mills to handle up to 2,000 ft. of strip per min.

FENN

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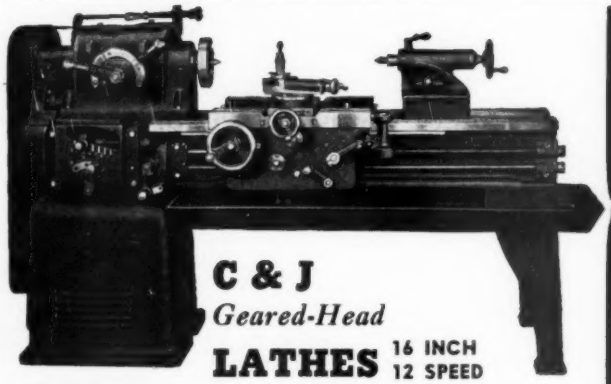

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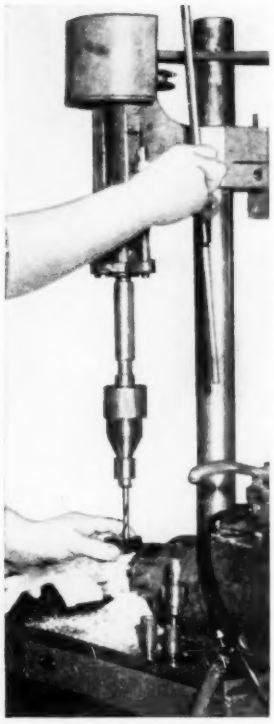

"Our drilling and reaming are performed with a single-spindle drill press, through use of the Wahlstrom Automatic Chuck," reports A. Dressler, Production Manager of Remington Rand Inc.'s Elmira plant. "With Wahlstrom Chucks, cutting tools are changed in seconds while the drill spindle is running... giving us high production at low cost."

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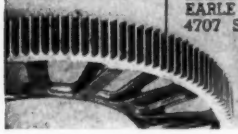

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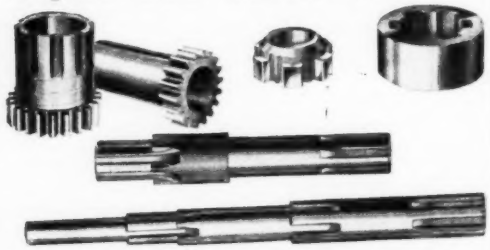

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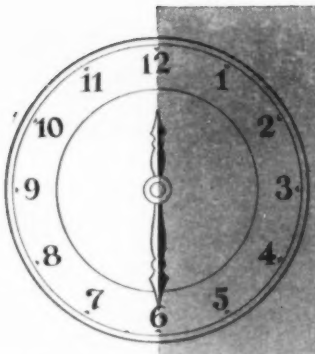
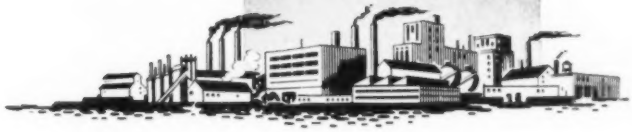


...for the half-hour that wasn't there



WHEN a Massachusetts company* surveyed their plant methods, they were amazed to find how much it was actually costing them to keep their machinery lubricated.

The lubrication cost was $14 every day. Added to that was the cost of the half-hour's production time lost every day while the machinery was stopped for lubrication.

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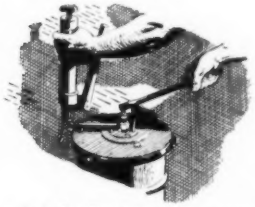

2. In loading grease guns . . . saves 3¾ man hours for every 100 pounds of lubricant loaded into hand guns.

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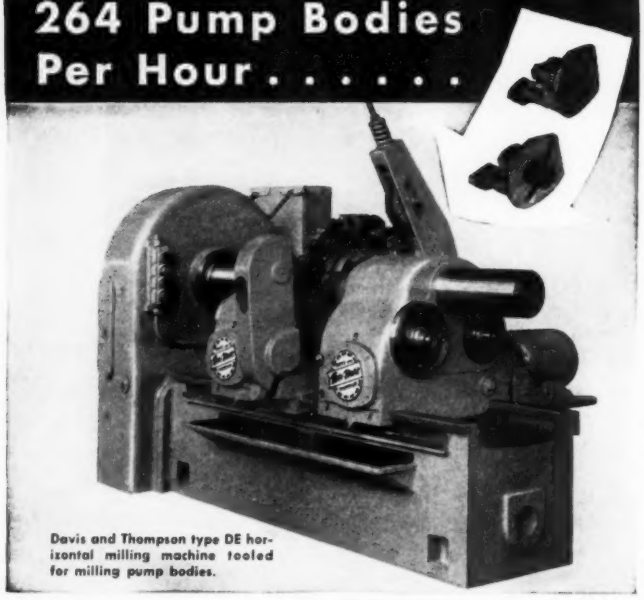

Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

Like all D&T machines this model DE is designed for long life and trouble-free operation. Each head has independent drive. There is backleash take up to mandrel. Anti-friction bearings throughout. Rapid traverse between cuts can be incorporated.

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DAVIS and THOMPSON Roto-Matic

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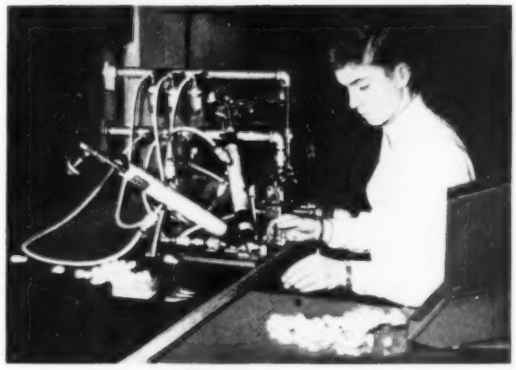
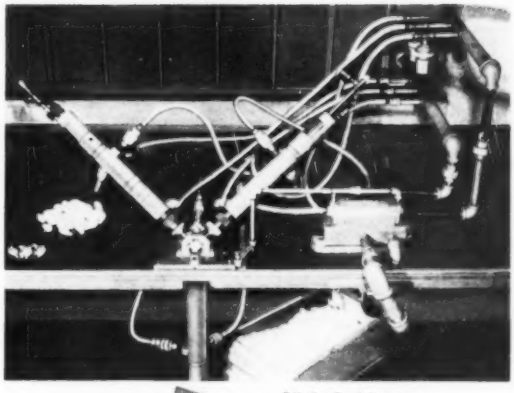
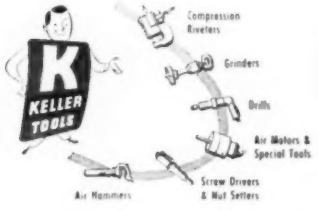
Probably Keller Airfeedrills can help speed your production . . . we will gladly discuss it with you.





*Keller Tool Company Trade Mark



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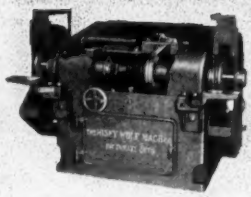

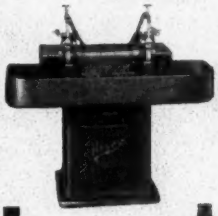

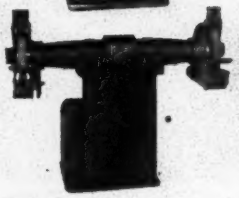

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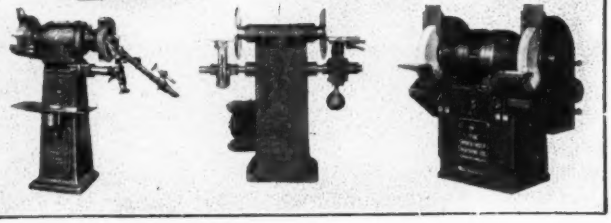

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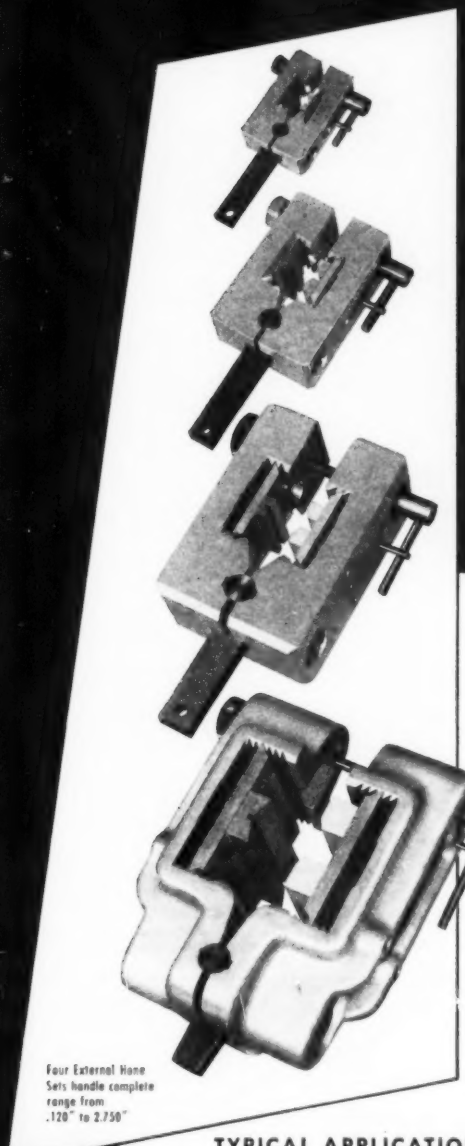

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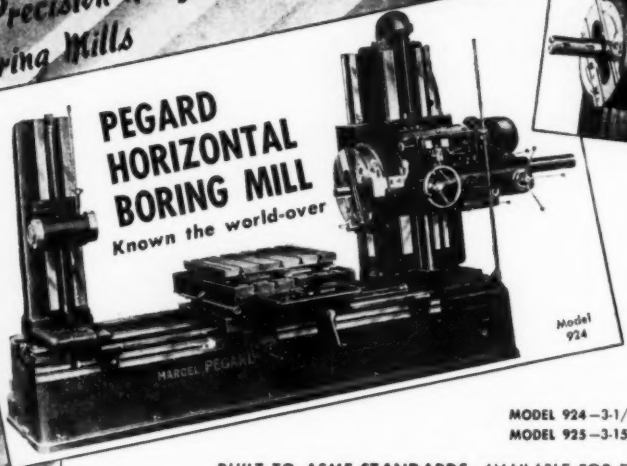

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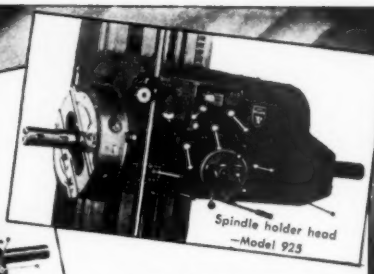
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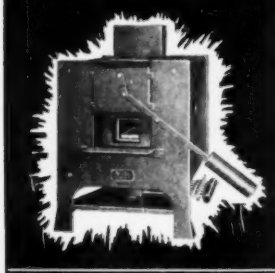

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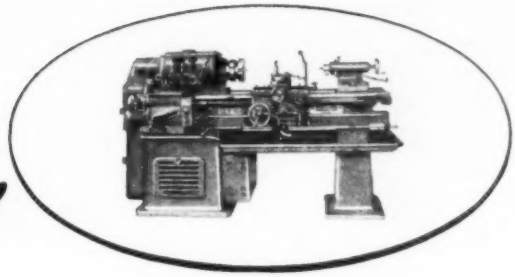

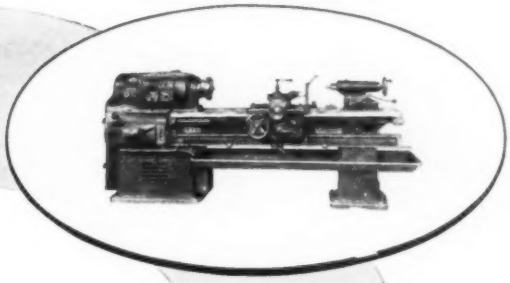

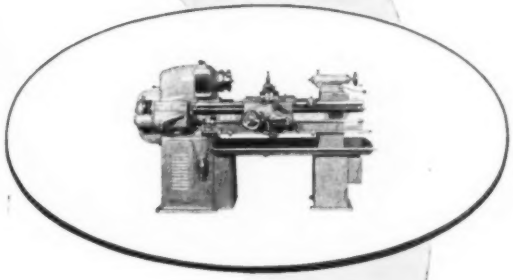

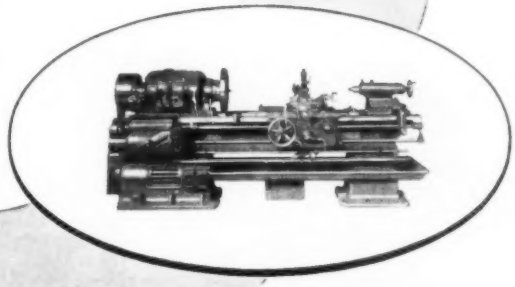

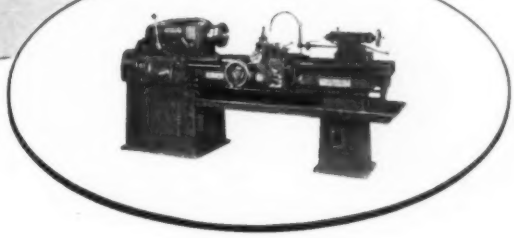

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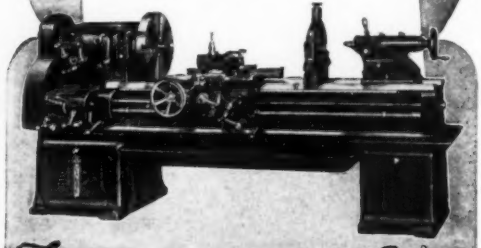

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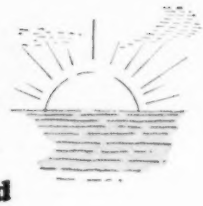

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It is readily available from manufacturers and warehouses. Tools made from it give service as good as or even better than the tungsten type of steel—most of the high speed steel used by leading tool manufacturers is the Molybdenum type.

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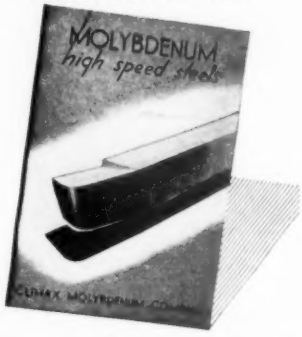

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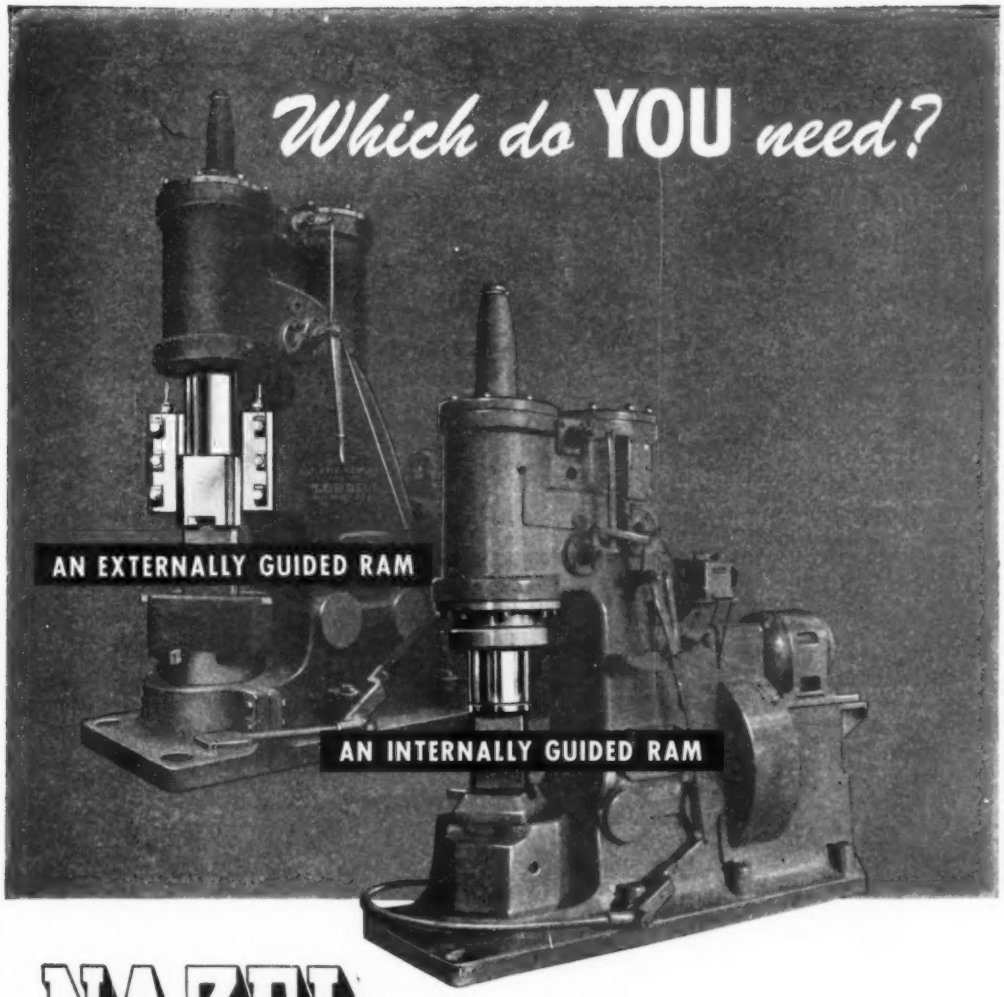

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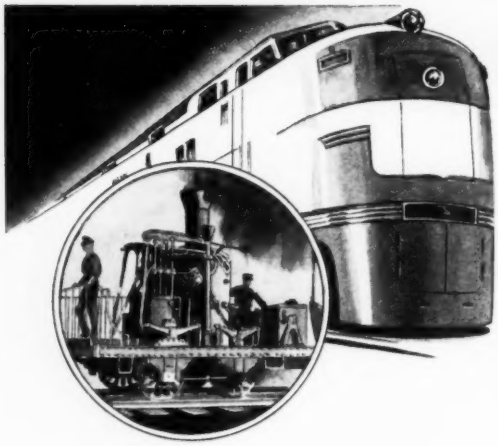

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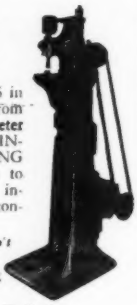

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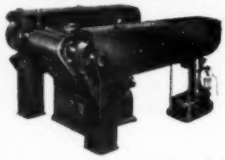

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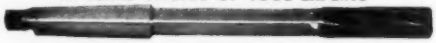

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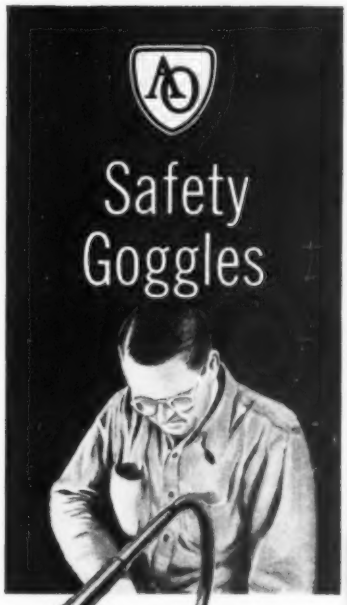

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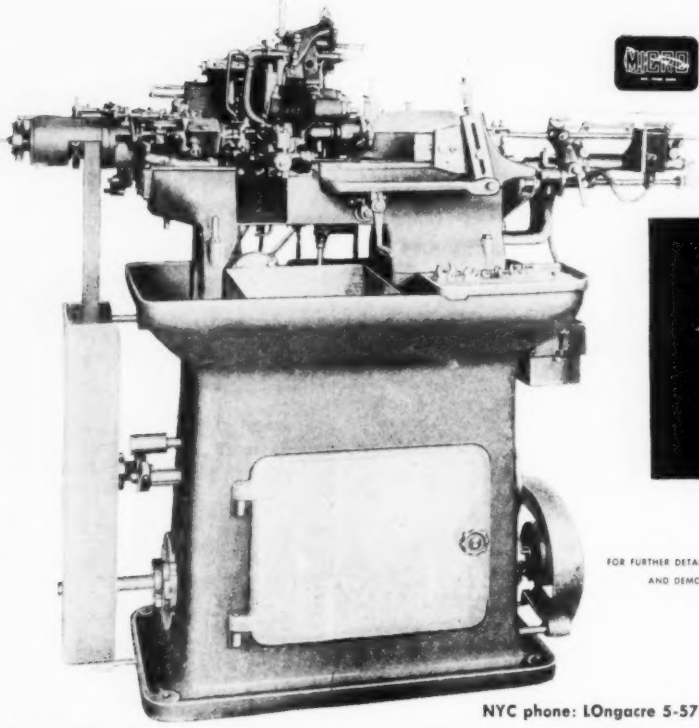

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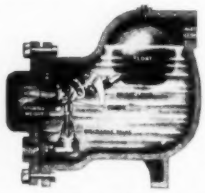

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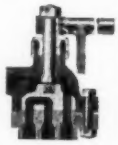

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Of American Machinist published Bi weekly at New York, N. Y. for October 1, 1951.

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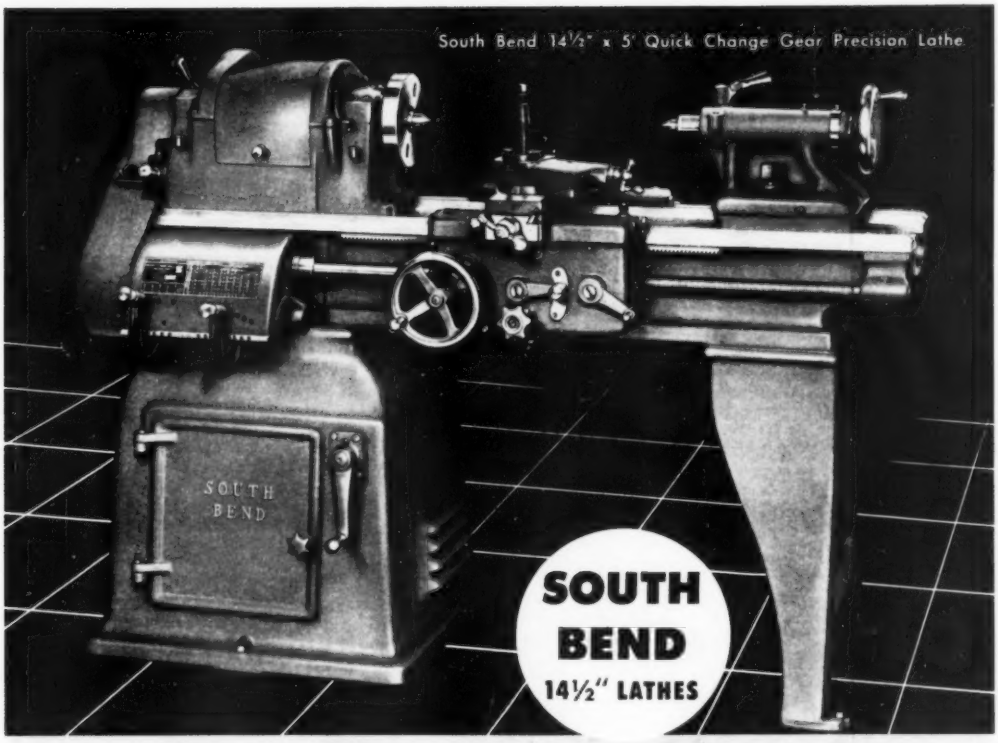

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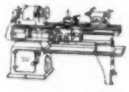
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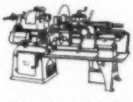
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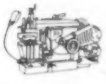
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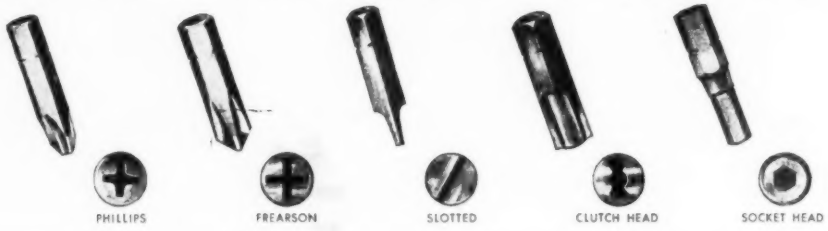

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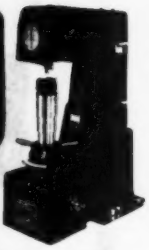

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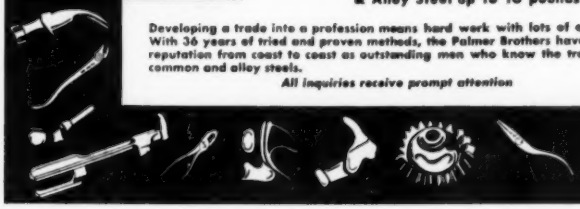

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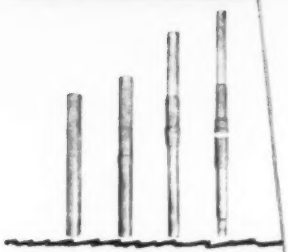

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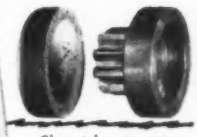

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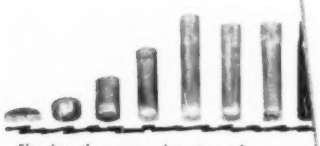

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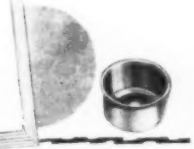

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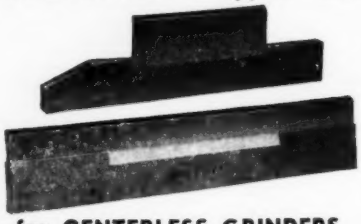

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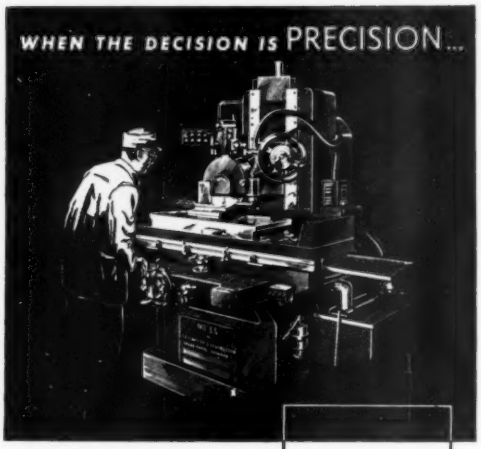

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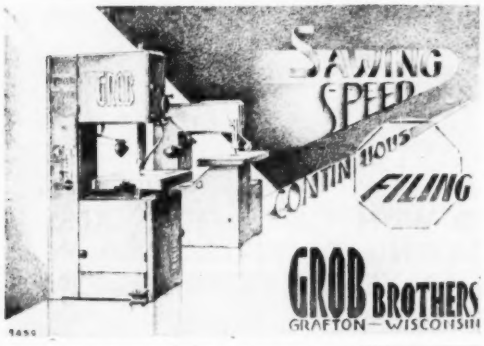

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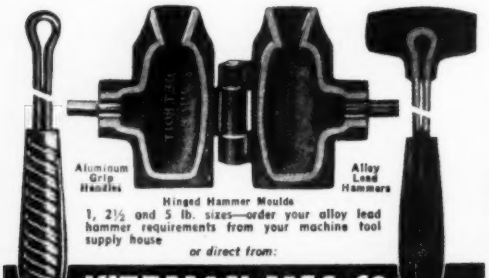

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Want to reduce your TAP BILL 50%? 59%? — even 75%?

No. 5 in a continuing study of Tap performance records made by users of Blake Tap Sharpening Equipment.

TAP PERFORMANCE

Before Sharpening Average 1¼" Taper Pipe Tap when lubricated cut 2800 holes in die cast aluminum. At this point tap cut under size and was discarded because worn cutting edge did not permit resharpening.

After Sharpening on Blake Equipment Similar Tap, from the same box, reground on Blake Flute Grinder cut average 6,000 holes *per grind*. Average *six grinds* before tap is discarded as too small or too short in thread length. Total holes: 36,000—an increase of over 1200% per tap.

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To get dollar-for-dollar value from your taps, you *must* sharpen them just as you do other cutting tools. The Blake Flute Grinder and the Blake Chamfer Grinder provide you with fast, accurate, and economical means for grinding straight flutes, spiral points, and the chamfered ends of your taps — a sure means of reducing your tap bill. Investigate today.

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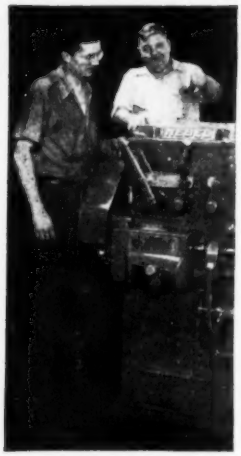

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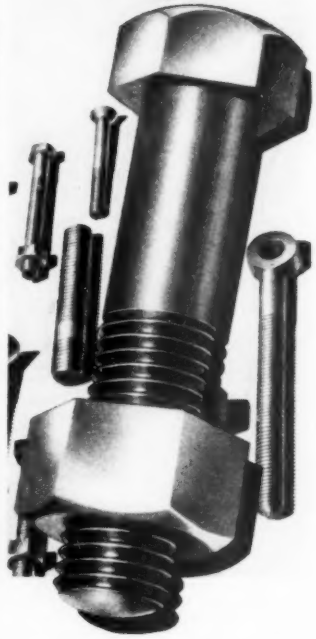

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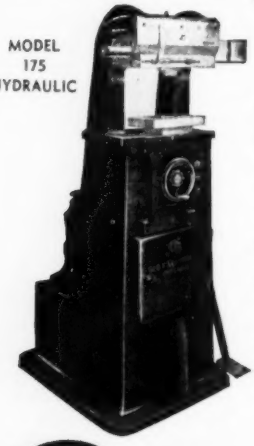

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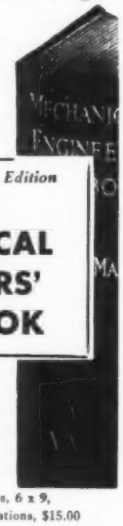

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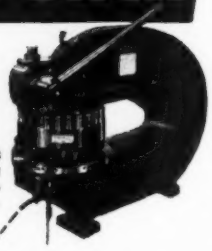

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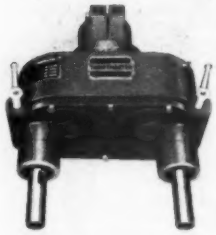

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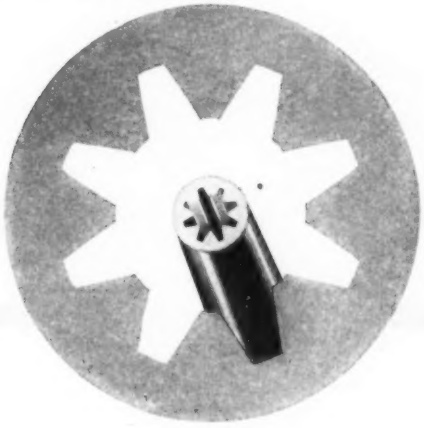

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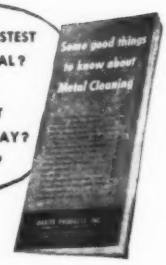

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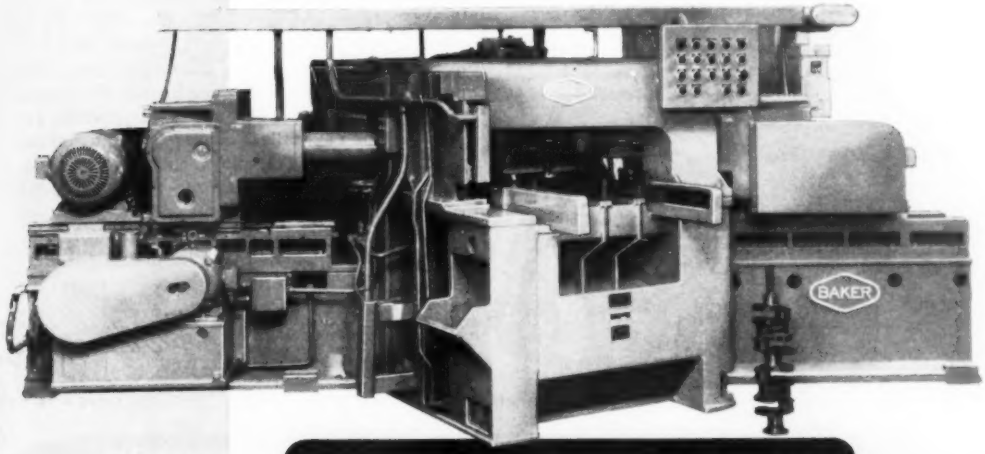

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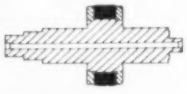

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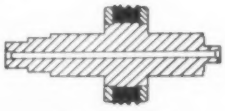

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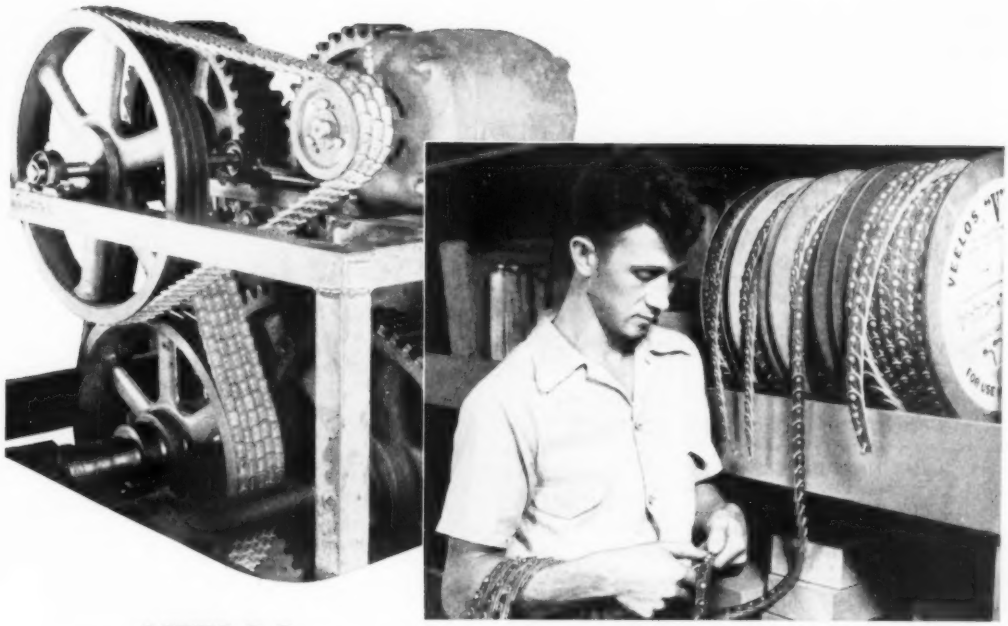

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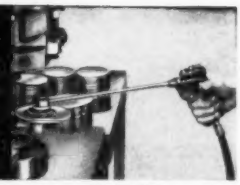

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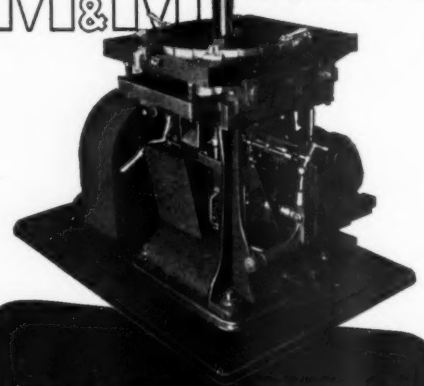

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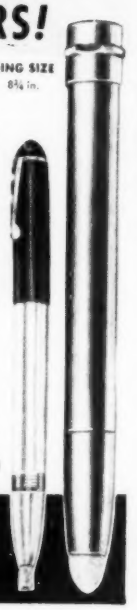
Yes, in *colors* for easier assembling, stocking, identification, etc. And industry is finding the Flo-master Felt-Tip Marker ideal for *all* types of marking. Its felt tip glides over any surface—metal, plastic, wood, etc. with broad, bold lines or fine lines. Flo-master semi-opaque inks—waterproof, non-smudging, fast-drying—come in a wide range of colors.

For light colored surfaces, use Transparent Inks with "POCKET SIZE" Flo-master. For dark, hard-to-mark surfaces, use Semi-opaque Inks with the "KING SIZE" Flo-master.

Ask your supplier or write to Cushman & Denison Mfg. Co., 153 W. 23rd St., N.Y. 11

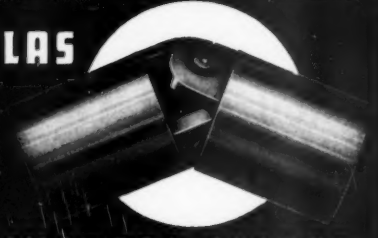
KING SIZE 8¾ in.

POCKET SIZE 6⅜ in.



Flo-master
FELT-TIP MARKER

ATLAS



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SHORT, STUBBY JAWS—for Maximum Strength—RESIST SPREAD

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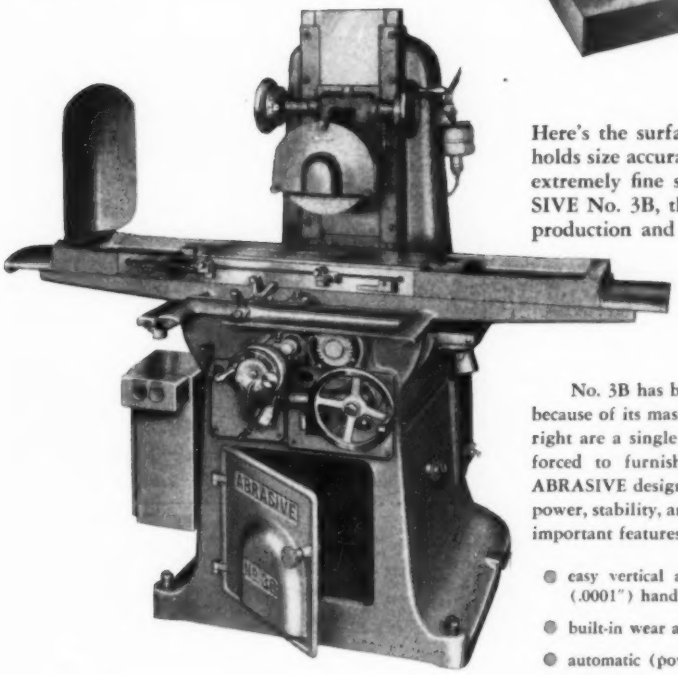
THE GRAY & PRIOR MACHINE CO., HARTFORD 5, CONN.

A GREAT GRINDER FOR FINISH



Here's the surface grinder that's fast — that holds size accurately — that produces work of extremely fine surface finish. It's the ABRASIVE No. 3B, the right grinder for countless production and tool room jobs.

No. 3B has been selected by leading industries because of its massive construction; the bed and upright are a single casting, heavily ribbed and reinforced to furnish utmost rigidity. This original ABRASIVE design-feature accounts, in part, for the power, stability, and endurance of the No. 3B. Other important features are:

- easy vertical adjustment of head with graduated (.0001") handwheel
- built-in wear adjustments
- automatic (power) longitudinal and cross feeds
- box-type saddle
- hydraulic table shock absorbers
- big capacity: 24" long x 8" wide x 12" high
- 3 H.P. motor (5 or 7½ H.P. for special work)
- super-precision, cartridge-type spindle
- one-shot lubrication system

It will pay you to get detailed facts and figures about Abrasive No. 3B and No. M3 Surface Grinders. Send for catalog. ABRASIVE MACHINE TOOL CO. 8 Dunellen Road, East Providence 14, Rhode Island. Distributors throughout the world.

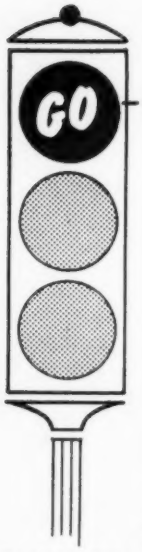
No. M3 Motorized Spindle Surface Grinder

This grinder has all the features of the No. 3B, plus the motorized spindle. No. M3 is widely used in the production of interchangeable parts . . . in the toolroom and on the production line.

Abrasive Quality is Reflected in the Finish of Your Product

ABRASIVE

ACCURACY BOOSTS PRODUCTION



to

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for special tools and machinery

Today, more than ever, with the need for high production with economy of operation, our years of experience in designing and manufacturing the right tools for the job can help you.

We will design and build any type of special tool or machine. Write us today.

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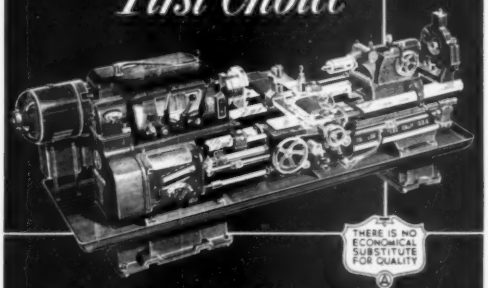

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Axelson Manufacturing Co.
Los Angeles 58 • New York City 7,
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PULLMAX DOES IT ALL!

Circle Cutting
Square Cutting
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Slot Cutting
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PULLMAX

Sheet and Plate Working Machines

Imagine, one machine doing all of these operations—seven models that work the finest gauges up to 11/32" (in mild steel). Also ideal for working stainless, non-ferrous metal, wire mesh. Leaves a smooth perpendicular cut with no further finishing required. Pullmax does it better . . . faster.

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AMERICAN PULLMAX CO., INC.

2605 North Western Avenue Chicago 47, Illinois

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On Boring and Facing Problems

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A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

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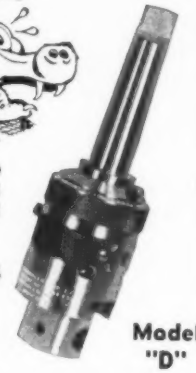


Write for Complete Details

Model "D"

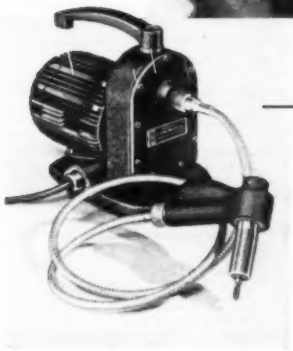
CHANDLER TOOL COMPANY

MUNCIE, INDIANA

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

Push! Pull! ... and the part is inspected!



It's the fastest thread gaging method ever devised

Nothing has ever before been offered that equals the inspection speed obtainable with this power thread gage. Just give a slight push on the handle — the gage is screwed into the work at *four revolutions per second*. Then reverse the pressure — the drive is immediately disengaged or the direction of revolution reversed.

Inspection is fast! . . . easy! . . . accurate! And at the end of the day the operator is still alert and fresh . . . yet frequently more than four times as many parts have been accurately checked as ever before.

It will pay you to write today for more information on this Taft-Peirce Power Thread Gaging Unit.

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

T-P means Top Precision

IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin over *200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

Right now he's got you in a bad spot.

Ivan is afraid of only one thing.

He fears your ability to out-produce him in guns, tanks, planes.

Frankly, he doesn't think you value your free system enough to do it . . . to make willingly the sacrifices he has squeezed out of the Russians.

But he's wrong!

Because you and all of us have set out to build more and better weapons—to do it faster all the time.

We must use every bit of know-how and inventive skill we have to improve our machines and methods—to turn out more and more for every hour we work. Only in this way can we become militarily strong.

But we've got to supply essential civilian needs as well. We can't allow needless shortages to take prices skyrocketing and lower the value of our dollar.

Sure, that means sacrifices for everybody. But doing this double job well is the only sure way to stop Ivan in his tracks—and to save the freedoms which are ours and which he has never known.

FREE . . . this important booklet tells you how our American System Grew Great

How Americans developed better machines, power and skills to build a great nation . . . Why we have been able to produce constantly more per hour . . . How this has given us the world's highest living standard.

How we can meet today's challenge—Why we must expand our productive capacity . . . supply arms and essential civilian needs, too. Read how this dynamic process works in free booklet, "The Miracle of America," endorsed by representatives of management and labor. Send for your free copy today!

MAIL THE COUPON—
The Advertising Council, Inc., 25 West 45th St., Dept. B. P. New York 19, N. Y.

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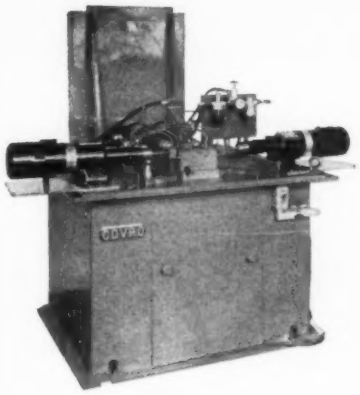
This advertisement, approved by representatives of management, labor and the public, is published in the national interest

McGRAW-HILL PUBLISHING COMPANY

THE BETTER WE PRODUCE
THE STRONGER WE GROW



TAPPING FOUR RADIAL HOLES SIMULTANEOUSLY

This machine, incorporating 4 Govro-Nelson Model ST Tapping Units, for tapping four 5/16-18 holes in a mild steel bracket, is an example of how Govro-Nelson Units can be used to speed up tapping operations.

The operator loads the machine manually, touches the start switch, and the part is automatically clamped by means of an air cylinder.

Thereupon, the four units automatically tap the four holes simultaneously. Upon completion of the tapping, the part is automatically unclamped. Output is at the rate of approximately 480 pieces per hour.

If you have parts requiring tapping or drilling of small holes, send samples and part prints and we shall be pleased to recommend the proper Automatic Units or quote on a complete set-up. Literature sent upon request.

GOVRO-NELSON CO.
Machinists of Precision Parts for 27 Years
1933 Antoinette, Detroit 8, Mich.

Automatic **DRILLING UNIT**

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CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

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$1.20 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Position Wanted and Individual Selling Opportunity advertising ½ the above rate payable in advance.
Box Numbers—counts as 1 line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.
The advertising rate is $10.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

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MACHINE TOOL Instructor. Young graduate engineer wanted immediately in engineering college in upstate New York. Opportunities for development work and scientific work on advanced level. Very good possibilities for the right man. P-1941, American Machinist.

MECHANICAL ENGINEER, $6400 per annum. Responsible for the basic design of aircraft maintenance facilities and determination of requirements for mechanical equipment necessary for overhaul, repair, modification or maintenance tests of aircraft, aircraft engines and accessories. Applicants may write or contact in person the Employment Office, Room 0015-A, Main Navy Building, Washington, D.C.

SHOP SUPERINTENDENT for medium sized screw machine plant. Brown & Sharpe and Greenlee multi-spindle automatic screw machines. Permanent—Excellent future. Top salary. P-2083, American Machinist.

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SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

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GEAR ENGINEER—Well grounded experience in gear methods, design and manufacturing. Desires opportunity offering responsibility in gearing. Graduate engineer. Ability to work with others. Would qualify for methods and design engineer or gear shop foreman. Minimum salary $6,800. PW-1968, American Machinist.

BUSINESS OPPORTUNITY

Mechanical Engineer with sales and manufacturing experience has $18,000 to invest in going business where services could be used to advantage. BO-2125, American Machinist.

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Consult: Z. H. Polachek
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USED STEEL FILES
Large or small lots—Top prices paid
FULTON TOOL COMPANY
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Man familiar with semi-automatic chucking machines, such as Kingsbury, New Britain-Gridley, Warner & Swasey turret lathes, with supervisory experience. 40-50 years of age. This is a permanent position with a nationally known organization located in Chicago, Illinois. State salary requirements, availability, references in letter of application.

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520 N. Michigan Avenue
Chicago 11, Illinois

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MATCH PLATE WORK A SPECIALTY
Let us have your pattern problems up to us—we will take care of them
GENERAL PATTERN WORKS
2233 Burk Street Cincinnati, Ohio

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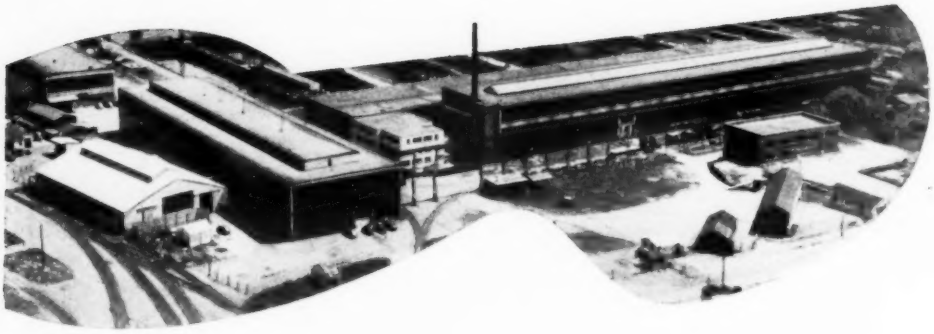

PORTLAND'S COMPLETE REBUILDING FACILITIES INCLUDE...

Lathes from 16" to 40" swing.

Boring Lathes up to 70' capacity.

Turret Lathes

Vertical Turret Lathes

Vertical Boring Mills up to 50' capacity

Planers up to 14' between housing and 40' tables

Planer Type Milling Machines

Gear Hobbers up to 96"

Crane Capacity to 50 tons, etc.

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PORTLAND MACHINE TOOL REBUILDERS, INC. SOUTH PORTLAND, ME.

PORTLAND MACHINE

EAST YARD,

DESIGNERS AND BUILDERS OF SPECIAL MACHINE TOOLS, FABRICATING

OUT OF THE MOTH BALLS AND LET...

PORTLAND *Rebuild them*

FOR FASTER, LOWER COST PRODUCTION

Many of the machine tools which helped win World War II are potentially capable of helping America assure peace through adequate defense production. All that many of these machine tools—large or small—need is modernizing through REBUILDING.

If you have any such machines in mothballs—if any of the machines on your production lines lend themselves to modernization—get in touch with PORTLAND and let's see what should be done to rebuild them to maximum productivity. With your usable machines and PORTLAND's facilities for rebuilding, you can save valuable, vital time (and money) in maintaining tough production schedules.

One of the "MUST" departments in the great PORTLAND REBUILDING PLANT IS the one devoted to rebuilding electric motors. Rewinding, re-fitting commutators, testing, inspecting, etc., are just a few of the many and complete facilities for meeting the electrical equipment needs of modern machine tools, needs which are carefully and painstakingly provided as an integral part of PORTLAND technique in rebuilding. Production line methods in the rebuilding of electric motors contributes to the speed with which PORTLAND machine tool rebuilding is handled. There are no bottlenecks in the PORTLAND plant due to non-availability of suitable motors for the machines being modernized.

Testing a rebuilt 3½" six-spindle Conomatic

TOOL REBUILDERS, *INCORPORATED*

SOUTH PORTLAND, MAINE • PHONE 5-0651

EQUIPMENT, INDUSTRIAL EQUIPMENT, STEEL MILL EQUIPMENT

LONG BED AUTOMATIC LATHE

#3A Lodge & Shipley Duomatic, late type, 22" swing, 171" centers, with 2 front and 2 rear carriages, power cross feed, coolant, pan, 25 H.P. motor. New 1942.

Abrasive Cutoff, #213 Campbell, 7½ H.P., late.
Automatic, 0G Brown & Sharpe, M. in base.
Boring Mill, #32 Lucas 3½" table type, PRT.
Boring Mill, 60 Gisholt, vertical, 2 hds.
Boring Mill, 3½" N-B-P, horiz. table type.
Boring Mills, 54" Colburn, vertical, 2 hds., M.D.
Drill, 3 spindle, #2MS Leland Gifford, Mtr. Spdles.
Drill, Radial, 6' Dreses, gear box, M.D.
Drill, Radial, 8' Western, gear box, M.D.
Drill, Radial 6'x17" American, M.D.
Drill, Radial, 3' American, Maxi-speed, motor-on-arm
Gear Hobber, #36H Gould & Eberhardt univ.
Gear Lapper, Type 10LS Fellows, 1942.
Gear Quenching Press, 15" Gleason, 1942.
Grinder, Cylindrical, 6"x18" Cincinnati Filmatic, 1943 (3)
Grinder, Surface, 8"x54" Thompson, M.D.
Grinder, Surface, #34 Abrasive Vert., '41.
Grinder Surface, #2 Robot, 6"x18", 1942 (2)
Grinder, #5 Bryant, Internal, late
Lathes, Duomatic, #3A Lodge & Shipley, 171" c.c., double carriage 1942.
Lathe, 38"x16' American 18 speed grd. hd., M.D.
Lathe, 4—20"x10' Americans, 12 speed grd. hd., M.D.
Lathe, 42"x20' NBP, grd. hd., M.D.

For: Quality and Integrity!!

Get the best! Good machinery, properly reconditioned and fully guaranteed. Here are a few representative items from stock.

Lathe, 54"x20' Johnson, taper, M.D.
Lathe, 36"x30' Putnam, grd. hd., M.D.
Lathe, Automatic, 12"x24" Lipe-Carbo.
Miller, Production, #12 Brown & Sharpe, 1942
Miller, Production, #08 Cincinnati, Horiz., 1943
Miller, Production, #1-12 Cincinnati, 1942.
Miller, Universal, #4 Cincinnati, Hi-Power, M.D.
Miller, Plain, #1½B Milwaukee, M.D.
Miller, Vertical, #14 Cochrane Bly, slot. attach.
Planer, 36"x36"x12' Cincinnati, 2 hds., M.D.
Shaper, 32" Cincinnati, gear box, M.D.
Shear, Rotary, #6 Quickwork 48"x1"
Turret Lathe, #2G Morey, 1942
Turret Lathe, #0 B. & S. wire feed, collets, 1942.
Turret Lathe, #2 Bardons & Oliver, 1943.
Welder, 50 KVA Acme air-press. spot, timer, late.

PIPE THREADERS: 3—#8R Oster "Rapiduction" 8" cap. M.D., 1943
1—8" Landis, 4½"-8" cap., AC M.D.
2—6" Landis, 2½"-6" cap., AC M.D., latest type.

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1535 N. DELAWARE AVE., PHILA. 25, PA.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS
No. 61 New Britain, 1⅝" cap. 1942.
1⅝" RA-4 Acme Gridley Automatic. Late.
9/16" RA-6 Acme Gridley Automatic. 1942.
1-1/16" Cleveland, Model A. 1943.
2" Cleveland, Model A. 1942.

DRILLS
No. B2A Natco Single Spdl. Latest.
16 Spindle Barnes, Hydraulic, 1942.

DRILLS, SENSITIVE
No. 4B-12 Edlund. 1942.
No. 2B-8 Edlund. 1942.

GEAR EQUIPMENT
No. 8 Gleason Revacycle Generator. 1940.
No. 645A3 Fellows Gear Shaper. 1943.
No. 72 Fellows Gear Shaper. 1942.
No. 7 L.S. Fellows Gear Lapper. 1944.
Pratt & Whitney Gear Grinder. 1942.
8" Red Wing Internal Shaver. 1942.
15" Red Wing External Lapper. 1942.
Red Wing Univ. Gear Checker. 1942.

GRINDERS, CYLINDRICAL
14"x168" Norton Plain Type C. 1942.
14"x48" Norton Type C Pl. Hyd. 1941.
14"x48" Landis Type C Pl. Hyd. 1943.
12"x36" Norton Univ. Type C. 1942.
10"x36" Cincinnati Plain Hyd. 1942.
10"x18" Landis Type C Pl. Hyd. 1942.

GRINDERS, INTERNAL
No. 24-36 Bryant Hydraulic. 1943.
No. 16 CP 16 Bryant Hydraulic. 1942.
No. 16-16 Bryant Hydraulic. 1942.
No. 172 Heald Hyd. Cap. 1940.
No. 81 Heald Plain Hyd. 1940.
No. 75A Heald, Two Motor. 1943.
No. 72A3 Heald Plain Hyd. 1943.
No. 50 Heald Plain Hydraulic. 1943.
No. 104 Rivett Int. & Ext. 1943.

GRINDERS, SURFACE
14"x30" P & W Vertical Hyd. 1942.
No. 22 Heald Rotary, 12" Chuck. 1943.

GRINDERS, THREAD
No. 31 Excello Thread Grinder. 1941.

GUN BARREL MACHINES
No. ½Bx50 P & W Reamer. Latest.
No. ½Bx30 P & W Reamer. Latest.
No. ½Bx50 P & W Rifler. Latest.

LATHES, ENGINE
20"x20' Center LeBlond Heavy Duty. 1941.
16"x27" Axelson. Late.

LATHES, PRODUCTION
No. 3FU Foster Fastermatic Platen. 1942.
No. 3D Gisholt Simplimatic. 1939.
20"x25" Fay Automatic. 1942.
14"x42" Monarch "Magna-Matic." 1941.
10"x12" LeBlond Multi-Cut. Late.
Lipe Carbo-Matic. 1942.
Lipe Mechanical Carbo. 1942.

LATHES, TURRET
No. 3AL Gisholt Universal. Late.
No. 5 Gisholt Universal. 1942.
No. 4AR Libby Hand Carriage. 1942.
No. 3 Gisholt Universal. 1942.
No. 2 Warner & Swasey Simplified. 1941.

MILLS, PLAIN
No. 2L Cincinnati. 1941.
No. 4B Kearney & Trecker, M.D.
No. 3B Kearney & Trecker, M.D.

MILLS, PRODUCTION
No. 2-18 to 2-24 Cincinnati. 1942.
No. 2-20 Kent-Owens Hydraulic. 1942.
No. 3A Sundstrand Copy Mill. 1942.

MILLING MACHINES, THREAD
6"x30" Lees-Bradner, Model LT. 1942.

WELDERS
Taylor-Winfield Hi-Wave. 1940.

Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

MacDell Availables in Late Type Guaranteed Machine Tools

Gisholt 3S Dynetric Balancer Mfg. 1942

Sundstrand No. 10 Automatic Lathe, Complete Mfg. 1945

Bardons & Oliver #3 Ram Type Universal Turret Lathe Mfg. 1941

Bardons & Oliver #2 Geared Electric Turret Lathe (2 available) Mfg. 1942

Heald No. 25A Rotary Surface Grinder, 24" Chuck Mfg. 1941

Arter A-1-8 Rotary Surface Grinder, 8" Chuck Mfg. 1943

Brown & Sharpe No. 12 Automatic Mill 18" Table Travel Mfg. 1942

Brown & Sharpe No. 2 14"x30" Universal Grinder Complete Internal Attach. Mfg. 1942

Cleveland 3¾" Model A Single Spindle, Automatic with Tooling Mfg. 1943

MacDell Corp.
1042 W. Lake St. Chicago 7, Ill.

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Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

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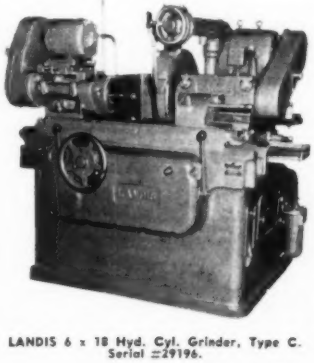
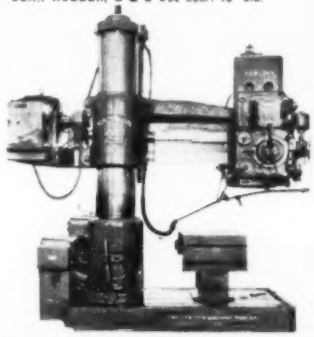
AUTOMATIC, Cleveland Model #B-1½" Sgl. Spdl.
AUTOMATIC, B & S #2G, 1" Cap. M.D.
AUTOMATIC, #53 Acme-Gridley 4-Spdl. 1" Cap.
AUTOMATIC, National-Acme Sgle. Spdl. 4¼".
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 H.
BORING MILL, #0 Giddings & Lewis, 3½" Bar.
BORING MILL, 24" Bullard M.D., V.T.L.
BORING MILL, Bullard 36" Rapid-Prod., M.D.
BARRELS, Tumbling, Almco, Lupomatic, Baird.
BORING MILL, Cleveland Horiz. 2½" bar, cap.
BUFFER, Model #95 U. S. Electric, 4 speed.
BROACH #3 LaPointe Horiz. 50" Str.
COMPRESSOR, Chicago Pneumatic 178 CFM.
CRANE, DET Shaw 10 tons, 58'8" span.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CUTTER, 74" Oswego Automatic Paper, M.D.
CRANE, DET Ricker 2 tons 11'9" span.
RADIAL DRILL, Carlton 4'-15" Motor on Arm.
RADIAL DRILL, Cincl.-Bickford 3½x9", A.C., M.D.
RADIAL DRILL, Cincl.-Bickford 5' arm, 13" col.
DRILL, Deep Hole, Avey-Draulic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel
DRILL, Edlund #2B, 3 spdle, #2 M.T., 16".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Natco Multiple Spindle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle
DRILL, Barnes, 24" S.S., #4 M.T., 1⅝" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILL, #2MS Leland Gifford, 4 spindle, #2 M.T.
DEEPFREEZE, Cascade 120° F., Industrial Chilling
FILING, #3 Thiel & Sewing, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap
FURNACE, Maehler Steam Oven, Serial #3543.
GRINDER, Ingersoll, Face Mill Cutter 30" cap.
GRINDER, Disc, Besley #20S, 18" Dble. End
GRINDER, Arter 18" Rotary Surface.
GRINDER, Cylindrical, Brown & Sharpe #2 Uni.
GRINDER, Oakley #3 Universal Cutter.
GRINDER, G & L #4 Univ. Tool & Cutter
GRINDER, Heald Rotary #25.
GRINDER, Hydraulic Contour Landis Cam 5"x40".
GRINDER, Cylindrical, Norton 10"x24".
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Brown & Sharpe Cylindrical #10, 6x18.
GRINDER, Cylindrical, Cincl. 6x18 Fitchmatic.
GRINDER, Thread, Jones & Lamson #TG-615
GRINDER, Landis Crankshaft 10x32 Hydraulic
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 14x36 Vert. Surface.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Springfield #2 Planer Type Surface.
GRINDER, Greenfield #12 Int. Hydromatic
GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface.
GRINDER, #22 Heald Horiz. Rotary Surface
GRINDER, Diamond Snagging 10 HP, 24"x4¼"
GRINDER, #60 & #70 Heald Internal.



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, Landis 6"x18" Hyd. Cyl. late type.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 18" dia.



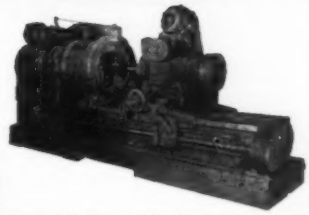
4'x15" CARLTON M.D. Radial Drill, 48 spls. speeds 22 to 1200 RPM.

GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #72 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
HEAT TREAT ROOM, complete with Furnaces.

BENDING ROLLS

Hilles & Jones #6 Pyramid Type Motor Driven Plate Bending Rolls. Size—14'x¾" Plate. Top roll—22" dia. Lower rolls—15" dia. Imm. Deliv.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LATHE, Bullng Dble. End #VMTS, Devine Bros.
LATHE, Pond 30"x108" Grd. Hd. With Equip.
LATHE, Bridgeford 32"x16' Q.C.G. Grd. Hd.
LATHE, Lodge & Shipley 24"x8' Heavy Duty.
LATHE, LeBlond 24"x14' Q.C.G. Grd. Hd.
LATHE, Hendey 20"x10' Q.C.G., Taper Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, Lodge & Shipley 18"x8', Q.C.G., Gr. Hd
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, American 18"x8' Q.C.G. Grd. Hd.
LATHE, LeBlond 18"x8' Q.C.G. Taper Attach.
LATHE, Lodge & Shipley 18"x8', Q.C.G., Grd. Hd
LATHE, Hendey 14"x8' Q.C.G. Taper Attach.
LATHE, LeBlond 14"x8' Q.C.G.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach.
LATHE, Lo-Swing 8"x108", M.D., A.C.
LATHES, TURRET, Warner & Swasey Univ. #4 1½".
LATHE, TURRET, Warner & Swasey #3A Univ. Grd. Hd. Bar feed, tooling & collets, AC Motor.
LATHE, TURRET, Simmons #2 Varl Drive 220 V.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Turret Oster #501 W.O. Rapiduction.
LATHE, TURRET, Warner & Swasey #6 Grd. Hd. Ram Type, Bar Feed, Motor in base.
MILL, 2A Brown & Sharpe Horiz. Univ.
MILL, #4B Brown & Sharpe H.D., Horiz.
MILL, #14 Garvin Plain Horiz.
MILL, #0Y Brown & Sharpe Plain Horiz.
MILL, Bridgeport Model #BH, M.D.
MILL, Van Norman M.D. Hand Mill, late.
MOTOR GENERATOR SET, 100 KW Gen. Elec.
MILL, Cinc. Horiz. #2, #3, #4, #5, High Power.
MILL, Cinc. Vert. #2 #3, #4, High Power.
MILL, Cinc. 18" Mfg. Type with Vert. head. Late.



Sommer & Adams #20A Threading, Hobbing & Boring Machine, swings 36", 42" centers, 18" cross feed, last one threading breech blocks on 105 MM guns.

MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hyd.
MILL, #1-M Kent-Owens M.D. Plain Horiz.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #3, Horiz. Univ.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING, MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, K & T #2B, Horiz.
NIBBLER, #2 Savage Roller Die ⅝"x36" cap.
NIBBLER, Gray Turret Type ¼"x24" cap.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILLER, Hanson Whitney 4"x9" Univ.
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PAPER SHREDDER, #10 Mitts & Merrill, M.D.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
TAPPER, W & S #1 Sgle. Spdle.
POWER PRESS, Bliss #104 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank, 45 tons.
PRESS, #78½ Bliss Toggle, 8½" Str. M.D.
PRESS, #14 Toledo, Horn. M.D.
PRESS, Robinson #5 O.B.I. 85 tons. M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS Toledo 59¼ S.S. 440 ton cap. 8" str.
PRESS Waterbury-Farrell High Speed 60 tons #3W.
PRESS, 60C Bliss Double Action, 3 crank.
WHEEL PRESS, Caldwell 200 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #66 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed

LESTER PHOENIX DIE CAST MACHINE

Model HP-2-SF. For alum., brass, and magnesium. Late model, 1947. Used less than 100 hrs., Imm. Deliv.

PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H&J #5 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Penn. Tubular Rivet.
ROLLS, #1 Buffalo Forge Wrapping.
ROUTER, #W240D, Onsrud, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x6" cap.
SAW, NS18-10 Grob Band & Butt Welder.
SAW, Band, Tannewitz #GH-36" High Speed
SHAPER, 18" American B.G. Motor drive.
SHAPER, 32" Cinc. B.G., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, hook geared, M.D.
SHEAR, Quickwork #A-1 Rotary 66" Throat. 18 ga.
SPRUE CUTTER, Milwaukee 50 tons, 2½" cap.
SURFACE PLATES & TABLES, all sizes.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

PLANERS

36"x36"x10' Betts, belted m.d., 2 heads on rail, 2 side heads
P10 Coulter Crank Type Shaper-Planer, 1 head, m.d.
20"x20"x5' Whitcomb-Blaisdell Planer, 1 head, m.d.
24"x24"x5' G. A. Gray Planer, belted m.d., 1 head on cross rail
30"x30"x10' Cincinnati, belted m.d., 2 heads
36"x36"x8' Gray, belt
36"x36"x10' Cincinnati, belted m.d., 2 heads
36"x36"x10' Niles, 2 heads, belt
36"x36"x16' G. A. Gray, reversing m.d.
36"x36"x18' Liberty, 4 heads
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
36"x36"x24' Cincinnati, belted m.d., 2 heads
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x14' Woodward & Powell, 4 heads
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
84"x72"x30' Niles, reversing m.d.
36"x36"x10' Niles, reversing m.d., 2 heads on rail, 1 side head

PRESSES

Chambersburg 30 ton Hydro Pneumatic
Metalwood B33, B45
Springfield No. 1 Straightening Press
Small cam operated Press, made by Swartz Tool Prod.
No. 21 Bliss O.B.I. Power Press, flywheel m.d.

PUNCHES

No. 2 Hilles & Jones Horizontal Punch, m.d.
No. 6 Long & Allstatter Single End, m.d.
No. 7 Thomas Vertical, latest
Pedrick & Ayer Pneumatic, 6" throat
#10 Kling Single End Punch, 48" depth of throat, m.d.
Robinson Lever Punch, 16" throat, hand operated

SAWS

5" Newton Cold Cut-off Machine, s.p.d.
Delta Abrasive Cut-off Machine
No. 3 Nutter & Barnes Cold Saw
No. 6 Cochran Bly Cold Saw
No. 138 Espen Lucas Cold Saw, m.d.
Gustav Wagner Cold Saw, m.d.
7½ H.P. Cincinnati Elec. Tool Co. Abrasive Cut-off Machine, type JCAW, Model 102
NEW Heller Hydraulic Cold Saw, Model SSH960, complete with electrical equip.

SHAPERS

16" Queen City H.D. Back Geared Crank Shaper, cone
16" Smith & Mills Plain Crank Shaper, cone
24" Cincinnati H.D. Back Geared Crank Shaper, m.d.
24" Potter & Johnston, cone
32" Morton Draw-Cut, m.d., late
36" Morton Draw-Cut, m.d., late
48" stroke Heavy Duty Morton Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type

SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
20-24" Dill, m.d.
10" Newton, m.d.
48" Niles-Bement-Pond Geared, m.d.
18" Niles-Bement, s.p.d.

TURRET LATHES AND SCREW MACHINES

No. 1 Cincinnati-Acme, Semi-Universal, m.d., chucking, Timken
No. 1L Gisholt, m.d., Timken
No. 2 Pratt & Whitney Shavers, m.d.
No. 2F Foster Fastermatic, m.d., Timken
No. 2L Gisholt, m.d., chucking, Timken
No. 3 Cincinnati Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 3L Gisholt, with cross sliding turret
No. 3A Warner & Swasey Universal, m.d., chucking
No. 4 Warner & Swasey Plain, cone, bar and chucking types
No. 4 Warner & Swasey Universal, m.d., chucking
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4FU Foster Fastermatic, m.d., latest
No. 7 Bardons & Oliver, cone
⅝" Pratt & Whitney Hand Screw Machine, cone
2½x24", 3x36", 3½x32", 4x34", Jones & Lamson Geared Head, m.d., bar and chucking types
3⅛" Cincinnati-Acme Geared Head Flat Turret, chucking and bar types
18" Libby Type A, m.d., chucking
20" Acme, s.p.d., bar
20" Acme, cone
28" Gisholt, cone
26" Libby Type C, m.d., chucking
No. 5 Woods Tilted Turret, Model D, cone
No. 601WD Oster Geared Head, Rapiduction m.d. in leg, chucking

WRITE FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

PRACTICALLY NEW
BLISS NO. 26A KNUCKLE JOINT PRESS

Tie-rod frame construction. Arranged for dial feed. Bed area 36"x40". Stroke 5". Air operated friction clutch.

National Machinery Exchange, Inc.
138 Mott St. New York 13, N. Y.
CAnal 6-2470

SETS OF HIGH SPEED DRILLS

#1-60 H.S. Drills, 60 Drills W/Stand, Set $13.00

1/16-½" H.S. Drills, 29 Drills W/Stand, Set $17.00

A-Z H.S. Drills, 26 Drills W/Stand, Set $15.00

½" to 1" H.S. Drills by 64ths, Straight or Taper Shank, 33 Drills, Set $110.00

VICTOR MACHINERY EXCHANGE INC.
251 Centre St., New York 13, N. Y.
CANAL 6-5575

MODERN MACHINES

#40 Landis Floor Type Horizontal Boring Mill
6D Potter & Johnson Automatic Chucking Machine
#35 Excello Thread Grinder
#61A Fellows Gear Shaper
#1A Warner & Swasey Turret Lathe
#30 Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic Screw Machines with Turret Drives
#3 Barber Coleman Hobbing Machine
G1-A Acme Gridley 1½ Automatic Screw Machine
#262 Barnes Camel Back Drill
16" Gould & Eberhardt Shaper
6 Spindle Allen Drill
22"x10' Centers Putnam Geared Head Gap Lathe

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

GEAR MACHINES

#36BM Three Spindle Gould & Eberhardt Bevel & Spur Gear Rougher 1941
96"x30" Gould & Eberhardt Gear Hobber
#12-12" Gleason Two Tool Straight Bevel Gear Rougher

GRINDERS—CYLINDRICAL

10"x18" Landis Type C Hydraulic—1940
10"x18" Norton Type C Hydraulic—reciprocating spindle—1944
6"x18" Landis Type C Hydraulic—rapid infeed—1941
18"x120" Norton Plain

GRINDERS—INTERNAL

#72A5 Heald Plain Extension Bridge—1942
#73 Heald Airplane Cylinder & Sleeve—1944
#81 Heald Plain Chuck—1942

GRINDER—SURFACE

15"x15"x22" Norton Openside

GRINDER—UNIVERSAL

12"x36" Cincinnati—1940

GRINDER—THREAD

Model TG-615 Jones & Lamson Automatic (2) 1941

HEADERS

#250F Manville DSSD—1944
#2 Manville DSSD
#00 Waterbury Farrel DSOD
#2C Manville SSSD Ball
#5 Manville SSSD Ball
#188c Manville S8SD Ball

LATHES

14"x6' REED PRENTICE (2)—1941
20"x9' Reed Prentice—1941
8"x84" Seneca Falls Le-Swing—1941
8"x120" Seneca Falls Le-Swing
26"x33' Swift Geared Head—1941

MILLERS

24" Cincinnati Automatic Duplex (2)
48" Cincinnati Automatic Duplex
#34-36 Cincinnati Plain Hydromatic (2) Tracer Controlled—1942

#1-12 Cincinnati Plain Automatic—1939
54"x18' Ingersoll Slab Miller

PLANER

120"x96"x20' Cincinnati Heavy Duty Box Table

SCREW MACHINES

#2G Brown & Sharpe—1941
#452 New Britain New-Matic Chucker

TURRET LATHES

#1L Gisholt Universal Geared Head—1941
#3 Gisholt Universal Ram Type
#4 Gisholt Universal Ram Type
#3A Warner & Swasey Universal Geared Head
#4A Warner & Swasey Universal
#4 Warner & Swasey Universal

MISCELLANEOUS

#3 LeBlond Rifling Machine—1941
Webster Tallmadge Single Gun Barrel Boring—1942
#430 WF & J Barnes Two-Spindle Deep Hole Drilling & Boring—1942
#602 Wallace Hydraulic Rotary Bending Machine—1944

J. L. LUCAS & SON, INC.

MACHINE TOOLS *Established in 1905*

BOX 3006A BRIDGEPORT 5, CONN. TEL. - FAIRFIELD 9-3393 CABLE - "LUCASTOOLS"

LATEST TYPE *Nearly New* MACHINES

NORTON 10x72" type C Pl. Cylindrical Grinder

BORING MILLS—Horizontal

FRANKLIN 4¾" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
NILES 8" bar floor type, motor drive

BORING MILLS—Vertical

BULLARD 8", 16" 6-spdle. "A" Mult-au-matic
COLBURN 72"; power rapid traverse; M.D.
CINCINNATI 72" "Hypro"; M.D.; late type

BROACHES

CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE #2L M.D. Late
LaPOINTE S.R.V. 15-ton 48" Stroke, Late

DRILLS—Miscellaneous

BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle; Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
MOLINE 6-spindle Hole-Hog 3¾"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.

GEAR CUTTING EQUIPMENT

BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE #13 Spur Bevel Cutter
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40 Tooth Rounders; M.D.
FELLOWS Nos. 61A, 6Z2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 12-M Involute Meas. Instr.; Late
FELLOWS 13-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON #4 and #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A, #8A gear generator; M.D.

GEAR HOBBERS

BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H. Late
GOULD & EBERHARDT No. 36H; Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late
PFAUTER RS1; late

GRINDERS—Plain Cyl. & Univ.

CINCINNATI 14x48" Univ.; late
CINCINNATI 14x72 Model ER Plain, Late
LANDIS 10x36, 16x36 C Pl. Hyd., Late
LANDIS 4x18 type H; M.D.; late
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 10x18" type C plain Hydr. M.D.
LANDIS 18x72" Type C; Hydr.; M.D.; Late
LANDIS 29"x180" centers Plain; M.D.
NORTON 6x30 plain; motor drive
NORTON 10x72" type C Plain; Late
NORTON 17x42" centers crankpin; Hydr. Dble. hd.; M.D.

GRINDERS—Surface

HEALD #22 Rotary, Late Type
HEALD #25A Rotary, Motor Drive
PRATT & WHITNEY 14x36" Model B, Late
BILLITTER & KLUNZ 48x196" Way Grinder,
TAFT PIERCE 6" Rotary, M.D.

GRINDERS—Miscellaneous

BRYANT No. 3, 5, 16-C-16, 16CP-16, 24 Intl. Hydr.; Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 81 "Sizematic"; Late
HEALD No. 72-A-5 "Gagematic" Int.; Late
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES—ENGINE & MFG.

AMERICAN 25"x220" centers; Timken; Late
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x33' centers geared; heavy
JONES & LAMSON "FAY" 20x25" Automatic; M.D.; Late
LEHMANN 25x96" cntr.; TIMKEN; grd M.D.
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. TACL Crankshaft; M.D.
LODGE & SHIPLEY 24x120" centers, Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 14x42" centers "Z" Magnamatic Auto.; TIMKEN; M.D.; Late
MONARCH 22"x456" Centers "CM" Precision; helical geared; TIMKEN; M.D.
NILES 30"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x48", geared; M.D.

LATHES—TURRET

LIBBY 1H-5 Universal, Late Tye
MOREY No. 2 ram type TIMKEN
JONES & LAMSON No. 8A Saddle Type; Late
WARNER & SWASEY No. 4; bar; M.D.; Late

MILLING MACHINES—Plain

CINCINNATI 0-8; M.D.; Late
CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI 2-24 Timken; Late
CINCINNATI No. 3 Plain; rectangular; M.D.
SUNDSTRAND No. 3 Ligidmill; TIMKEN

MILLING MACHINES—MFG.

CINCINNATI #24 Duplex; SPD
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16" Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FEN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical

CINCINNATI 0-8 Mod EA Automatic PRT; M.D.; Late

MILLING MACHINES—Thread

HALL Style D Planetary, Late Type
LEES BRADNER HT 12", 54", M.D.; Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

PLANERS

BETTS CONSOLIDATED 84"x92"x16' 4 heads
PRT Box Table; DC Reversing M.D.
BETTS CONSOLIDATED 108"x84"x14' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
DETRICK & HARVEY 48"x48"x16' hydr.
LIBERTY 48"x48"x16' 4 hds. Double housing; vari-voltage
LIBERTY 72"x48"x20' 4 heads; Convertible openside vari-voltage drive; late
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"x20'; 4 heads; M.D.

SAWS

ESPEN LUCAS No. 670-30' cap Hydr.; Late
HELLER Model SS-1, 6¾" Cap Cold Saw

SCREW MACHINES AUTOMATIC

NEW BRITAIN GRIDLEY Model 65 6 Spindle Chucker, Late
BROWN & SHARPE 60G High Speed, Late
GYROMATIC Model 40 1⅝" 6 Spindle, Late

SHAPERS—SLOTTERS

CINCINNATI 16", Heavy; PRT; Late
LeMAIRE 18" Vertical Hydraulic; Late
PRATT & WHITNEY 6" Vertical; M.D.

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For MODERN high quality machine tools nearly all built new since 1941. These tools are priced well within your equipment budget. *Wire, write or phone for pictures, details and prices, today.*

LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late

PRESSES

BESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
BIRDSBORO 325 ton Vert Hydr; Late
BLISS No. 416A Toggle Drawing; tie rod; steel gearing
BLISS No. 3½ A geared toggle; dble. acting
CHAMBERSBURG Straightening, 24"; M.D.
GLEASON 15", 25" Quenching; hydr.; M.D.
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
TOLEDO #663-M S.A. Knuckle Joint, 400 tons; late
UNITED ENG. 500 ton hydr. forging
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS

ACME 2" forging, upsetting; late
AJAX 3½" forging, upsetting; M.D.
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
GROB NS-24 Band Saw; M.D.; Late
LANDIS 2" sgle. Dble. Spdle. Threaders; M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 DSOD Readher; M.D.
MANVILLE 1A DSSD Heater; M.D.
MANVILLE No. 3 Rebanders; Late
MANVILLE No. 3C Thread Roller; M.D.
NORTON 2F, 26F Lapping Machines; Late
SAUNDERS 8-18" Pipe Machine; M.D.
U.S. TOOL 810-B Cutter Reliever; Late
WATERBURY FARREL No. 11 Thread Roller

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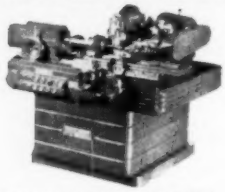

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Model #31 Excello Precision Thread Grinders. 5" diameter work ground, 18" between centers, 8" maximum thread length ground.

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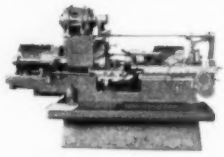

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Model "B" 18" Cleveland Shaft Machines. 1½" Capacity, 19½" stock feed stroke. 13½" Milling length.

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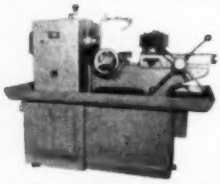

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Air Compressor Outfit, Kellogg 5 HP.
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Grinder, #10 B&S, 6x18" Elect. Hyd., MD.
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Marking Machines, Cadillac & Matthews.
Miller, #1 Burke, Bench, MD. (new)
Nipple Machine, Landis, 1½" Lanco Hd, MD.
Press, OBI, #2½ Niagara, dial feed, MD.
Shear, Foot, 48"x16 ga. Wysong & Miles.
Turret Lathe, #1 W&S, bar feed, MD.
Turret Lathe, #5 B&G., chuck, MD.
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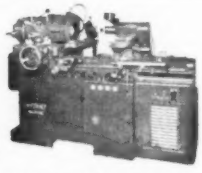

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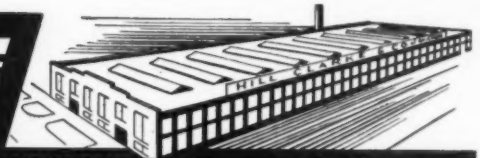

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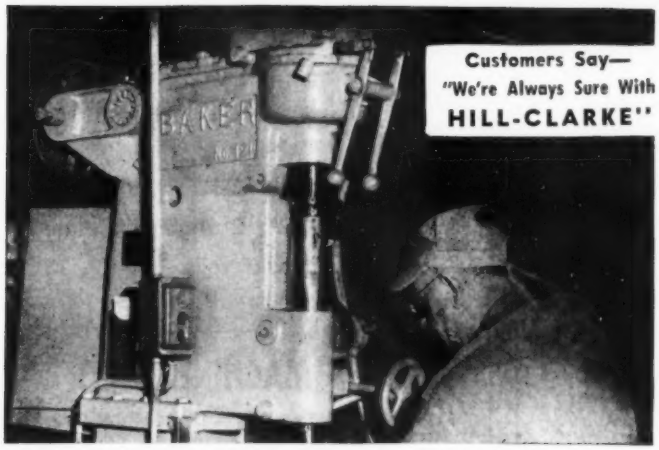

FOR THE 40 YEARS THE OLIVER CORPORATION has purchased Hill-Clarke's machines, they've found thier dependability and long-performance prove their economy over ordinary second-hand machines. Above is one of Oliver's Hill-Clarkes used at their Charles City plant.

AUTOMATICS

7/8" G Model Gridley
1-1/16" Model A Cleveland (1942)
1 1/8" Foote Burt (1941)
1 3/4" Model G 4 Spdl. Gridley

DRILLS

2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester ('42)
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

3" Lucas Hor. Bor. Mill.
Rockford—3 1/8" Bar
42" N-B-P Vert. Bor. Mill.
72" Niles—Hvy. Pattern

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. 25-A Heald Surface Grinder
5B Bryant Internal
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2 1/4"x24" Jones & Lamson
No. 2A Warner & Swasey s.p.d.
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.

MILLING MACHINES

No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x36" Lees-Bradner—LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

12" Pratt & Whitney Vert. Shaper 1943
24" Milwaukee Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
No. 200 Micromatic Horiz. Hone, 1 Spdl.
No. H-2 Micromatic Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
75 Ton Hannifin Hyd. 4 post press

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service

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30" stroke, 200 Ton Verson Model #40 ES, 1943 machine, Straight Side, 30 HP motor.

TOGGLE DRAWING PRESS

500 Ton, Model #410-A, "Bliss", 62" shut height, 60" x 84" bed area.

DOUBLE CRANK PRESS

255 Ton, Model #96-D Toledo Try-Out Press, 30" shut height, 42" x 84" bed.

Also

150 Ton, Model #60-D-84, Cleveland 12" stroke, 30" shut height, 46" x 86" bed.

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McKay ½" to 2", 4 High Leveller, 17" dia. rolls, 13 rolls, backed-up, 1943 machine, 350 HP motor, Selling for 1/5 of New Cost, Used only 6 months.

McKay ¼ to 2", 2 High Hot Plate Leveller, 15" dia. rolls, 150 HP, 13 rolls.

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BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

AMERICAN 20"x16' QUICK CHANGE GEAR LATHE. M.D. Old, but good.

BARNES HEAVY DUTY 26", 4-SPINDLE DRILL. 1 spindle for tapping M.D. #4 M.T.

GRINDERS—CYLINDRICAL. B & S #11. 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

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BOLT THREADER, 1½" Williams Reliance
BORING MILL, 3½" bar G. & L. Table Type M.D.
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 72" N.B.P., P.R.T., M.D.
BORING MILLS, 4" bar Landis Floor 4½" bar Niles table, Dual Control, 3" bar Univ.
BORE-HONE, Barnes, 10" stroke, 6" bore, '42
BRASS LATHE, 21" Acme, Late, Hardened Ways
DRILLS 21" Reyersford-Excelsior New & Used
DRILL 25" Weigel, Tapping, M.D.
DRILL, 6 Spin. Allen, Pw. Fd., No. 2 M.T.
DRILL GRINDER, 3" capty. Grand Rapids M.D.
FACE GRINDER, 84" Bridgeport 32" wheel
GEAR GENERATOR, 3" Gleason straight, Late
GEAR HOBBER, 36H Gould & Eberhardt
GEAR HOBBER, #12 Barber Colman
GEAR PLANER, "11" Rienecker, Bevel
GEAR SHAPER, No. 75 Fellows High Speed 6IA, 6I, & 64A, 8 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 16"x48 Cinci., Cyl., M.D.
GRINDER, No. 8-T Sellers, Tool, '42
GRINDER, No. 16Y2R Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72A3 Heald Internal Pl., '42
GRINDER, No. 72A5 Heald Internal, 1943
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, UNIV. 12"x36" Thompson M.D.
LATHES, 42"x30' cen. Putnam Grd Hd. M.D.
36"x20' cen. Putnam, 2 Carr. T.A.
32"x25' cen. Pitts. Sommerfeld, 2 carr. T.A., '42
25"x12' cen. LeBlond Grd. Hd., M.D.
25"x12' bed Bridgeford Grd. Hd. (3)
22"/46"x10' cen. Putnam Ext. Bed Gap M.D.
20"x48" cen. Amer. 8 sp. T.A. (3)
18"x10' bed L. & S. Select Hd., T.A., M.D.
16"x6' & 12"x6' Hendeys Grd. Hd., T.A. (2)
12"x6' bed Reed Prentice, 14½" sw. Grd. Hd.
TURRET LA., No. 3AL Gisholt, 6¼" hole in spin.
26" Libby "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ. 3½" capty. Bar, Timken
THREAD MILLER, 12"x90" Morey Shields, '42
MILLER, #2H K. & T. Univ 1944
MILLER, 21½" B. & S. Univ. Vert. Attach. M.D.
MILLER, 54" Newton Vert. Rotary M.D. 30 HP
MILLER UNIV., No. 2A Brown & Sharpe
MILLERS, Nos. 2 & 3 Cinci. Plain, Turner M.D.
No. 1½ Cinci. Pl. Lima Dr., Vert. Attach.
MILLERS, HORIZ. No. 4 Cinci. High Power
PIPE THREADER, 2" Landis, AC. M.D.
PLANER, 48"x36"x8' Cinci. 4 Hd., Box, PRT, Force Feed
RADIAL DRILL, 7'10" col. Amer. Trip. Purp. M.D.
SHAPER, 24" Stockbridge, gear box M.D.
SHAPERS, 20" & 16" G.E., AC. M.D.
36" Morton, Draw-Cut M.D.

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(2) W & S #2 Chuckers (1942)
(4) W & S #2 Bar Feed (1942) 1" Cap.
(3) Morey #2G Bar & Power to Turret (1941) 1" Cap.
(1) Libby 3R Bar Feed 1¾" (1942).
(1) Libby 3R Chucker 2¼" (1942)
(1) Foster Univ. 1¾" Bar & Chuck (1930)
(1) Libby Univ. 5" Bar & Chuck (1930)

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Both older but good condition. Motors thru gear box base.

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CAM MILLERS

VAN NORMAN: Contour Miller 10CT, for milling flat cams and similar work

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
BARNES: 201¼ 2-spindle on 3-spindle base
BAKER: 217 Upright Heavy Duty, 2" capacity
FOSDICK: No. 4BM Upright, High Speed, ⅞" drilling capacity, 12" overhang
PROVIDENCE ENG: FV-6 Sensitive 6 motor-driven spindles, ⅝" capacity
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BARBER-COLMAN: No. 3 Hobber
BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
HAMILTON: No. 1 Hobber, 6" dia.
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 24" long (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23⅛ P.D.

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FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red Ring Tester

GRINDERS—CYLINDRICAL

BROWN & SHARPE No. 23, capacity 10"x48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
CINCINNATI, 10"x36" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts

Grinders—Cylindrical—*Cont.*

NORTON: 6"x18" plain, hydraulic
NORTON: 10"x18" plain, hydraulic
NORTON: 10"x18" 45° angle wheel head
NORTON: Crankshaft Grinder, 23"x72"
VAN NORMAN: #666 Crankshaft Regrinder, 20"x48"

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GLEASON No. 17 Spiral, Zerol & Hypoid, capacity 23⅛ P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 112 with high frequency wheel head, 42000 rpm
BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain, Internal
HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal
LANDIS: Hydraulic, 8" stroke x 15" dia.

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½" diameter
VAN NORMAN: #639, capacity 7" diameter
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Universal, capacity up to 3½" dia.

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: No. 31 external, dia. 5"x 18" centers
JONES & LAMSON: TG-1245 External, 12" dia. x 45" centers, with additional capacity if required

HONING MACHINES

BARNES: No. 806H Vertical, 24" Stroke
MICROMATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity

LAPPING MACHINES

FELLOWS: 8LSI and 13LSI Gear Lappers
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work
SCHRANER: Model A External Cylindrical Lapper—4 heads

LATHES—PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48": centers
LODGE & SHIPLEY: No. 3A Duomatic, 27" center
MONARCH: 24"x60" Geared Head
MICHIGAN: 1708 Relieving, 8"x24"
MICHIGAN: 1712 Relieving, 12"x32"

Lathes—Production—*Cont.*

PRATT & WHITNEY: 16"x40" Toolroom
WILLSON: 15" x 48" Geared Head Motor Driven (New)

LATHES—TURRET

GISHOLT: #2L Saddle Type
HERBERT: #8 for chuck work, 20" swing (New machines)
HERBERT: Turret Lathes, all sizes (New)
WARNER & SWASEY: 2A, Saddle Type
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 60" dia. (New)

MILLING MACHINE

BRIDGEPORT: Vertical Miller, power feed
CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" table with power feed, high spindle speeds, for toolroom work
VAN NORMAN: Contour Miller 10CT, for milling flat cams and similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity
NATCO: Vertical Tapper 16 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

FELLOWS: Flat Top Helical Gear Cutter
OLIVER: #2 Face Miller Grinder
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

MISCELLANEOUS

CUT-OFF: Campbell, Abrasive 423 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: Screw, Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
RACK CUTTING MACHINE: Sykes 24" to 36" length capacity (New)
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New)

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MACHINE TOOL ENGINEERS SINCE 1919

RELIABILITY has been earned by
WIGGLESWORTH MACHINE TOOLS

AUTOMATICS
9/16" RA-6 Nat'l Acme, late, equipped
2" 4 Spindle Cone, 1943
8¾" Conematic, 5 spindle
1½" Billings & Spencer Dimatic Cutoff

BORING MILLS
4" Landis horizontal, floor type
Century sgle. spdle. hyd. boring machine
72" King, two heads on rail, p.r., r.t.

GRINDERS
6x30" Cinn. cylindrical, model EA
Rotorex Universal Tool and Cutter
10x48" Norton C, semi-auto. cylindrical
12x36" Cincinnati plain cylindrical
14x36" Norton C semi-auto., cyl.
72A5 Heald Internal, late, 3' ext.
73 Heald Internal, 1944, like new
#300 Hanchett surface, 14x60"
#76RA Rogers knife grinder, 76"
P & W deep hole drill grinder, late
Oliver single point tool
Model 1311 P & W contour, late
10G Sellers, single end, horizontal
5 HP Marschke, single end

DRILLS
#24 Footburt, 3 spdle., #5 M.T., 24"
#2 Allen, 2, 4, 6 spdle., #2 M.T.
4'11" Canedy Otto, late
21" Cinn. Bickford, 4 spdle. #3 M.T.
36" Synder single, #5 M.T.
#4½ Footburt, 4 spindle, #5 M.T.
#1½ Avey, 4 spdle., high speed
#2 Detroit Semi-automatic, horiz.
Kruger 16", six station
Type 14 Natco 12 spindle
#2 LMS Leland-Gifford 4 spindle deep hole
#2 Bausch 24 spdle., #2 M.T.
D6 Colburn, single spindle, #5 M.T.
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle, older

GEAR MACHINERY
672 B & S cutter
7A Fellows, shaper, high speed, hvy dty
61A Fellows, shaper, high speed precision

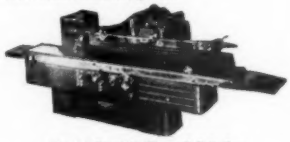
LATHES & TURRETS
#3 W & S Universal, serial 430280
36"x17' ctrs. Bridgeport, g. h.
10x26" Sheldon, late
27-30"x30' ctrs., Lodge & Shipley
14x36" ctrs. Lodge & Shipley
22-33"x9' Morris, geared head
#4A W & S Universal, geared head
Hepburn Shell
12"x30" centers, Hendey q.c.g.
#12 LeBlond Automatic Production
Model LoSwing 8 x 108" centers, g. h.
Gisholt Simplimatic, platen type
36" x 14' ctr. LeBlond, cone
36" x 14' centers, American, late

MILLS
#2 Kempsmith plain horizontal
#2 Cleveland plain horizontal
#3 B & S vertical
#3 Sundstrand Rigidmill, late
#4 Cincinnati High Power vertical
#5 B & S plain horizontal
#5 B & S vertical, knee type
24" Cincinnati Duplex
Briggs production, hydraulic
1-8 Kent Owens production, hydraulic
Universal head for #2H K & T
10CT Van Norman Contour

FURNACES
Whiting Converter, 2 ton cap., late
Lithdraw heat treat, 1200° F, late
Thermonic Induction, heat treat, late

MISCELLANEOUS
BENDING PRESS: 4'x½" Cyril Bath
PLANER: 48x48"x16' Detrick & Harvey
LAPPERS: #2 Cincinnati Centerless, late
86-36" Gardner, vert. spdle.
BROACH: 10 ton Oilgear, model PED, late
HAMMER: 300# Bradley Upright Helve
PROFILER: Betts, 2 spindle
COMPARATOR: J & L, 30" shadowgraph
BROACH: #4 Lapointe, horizontal
WELDERS: Hobart and P & H, Arc, 400 amp.
BULLDOZER: #2 Ajax High Speed, 30 ton
SHAPER: 25" Smith & Mills, backgeared
SHEAR: #23 Niagara 3' 14 gauge, late
#6 Quick-work rotary, 4' throat, 1"

THREADERS & TAPPERS
TG185 J & L grinder, 12 x 15"
6x80" P & W miller
Bausch radial tapper, ½" cap.
Haskins tapper, type 2 CAP, 5/16"
#2BG Garvin tapper, 1¼" cap.
TG 615 J & L grinder, late
#2 Dalzen, 3" O.D., grinder
Model 40 Lees Bradner, miller
LT 6 x 36 Lees Bradner
#33 Excello External, grinder



No. 50 Excello Thread Grinder

T. R. WIGGLESWORTH MACHINERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

MACHINERY VALUES

PRESSES
Niagara No. 13 Plain Horn Press
McDonald No. 31 O.B.I. Press
Bliss No. 52 Straight Side Single Crank Single Geared Press
No. 162 Bliss Straight Side Gap Frame Dial Feed Cartridge Press (2)
No. 59 Niagara Straight Side Single Crank Press—150 Ton

FORGING MACHINES
No. 10 Buffalo Armor Plate Bar Shear
2000 lb. Steam Drop Hammer
1500 lb. Steam Drop Hammer
¾" Acme Upsetter
1½" Acme Upsetting & Forging Machine
Cleveland Model Z Single End Punch and Shear
3000 lb. Chambersburg Board Drop Hammer
5" Acme Upsetting and Forging Machine
#2 Hilles & Jones Bar Shear, Cap. 2½"RD
Match & Merryweather #3 Metal Saw, Latest Model

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USED MACHINERY

Norton 6"x18" Horiz. Hyd. Surf. Grinder 1942
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
Adams No. 4 M.D. Gear Hobber, cap. 36" dia. x 12" face.
Peerless 10"x10" Cap. A.C. M.D.
Universal Shaping Saw.
Cincinnati 48" S.P.D. Auto. Production Miller
Kelly 32" M.D. Gear Box Crank Shaper Tilt. table.
Cincinnati 36"x36"x10' Table 2-Hd. Planer.
Barnes No. 212 Vert. Hyd. Hone Mach. A.C. M.D.
Amer. 16"x6' grd. hd. q.c.g. m.d. Engine Lathes.
Baush 44" Hvy. Duty Vert. Boring Mill, 2 Hds.
Hilles & Jones 2" Cap. Guillotine Shear.
Dill 18" Str. A.C. M.D. Vert. Slotter adj. head.
G & L and Universal 3" Bar Horiz. Boring Mills.
20" All Grd. Camel Back Drill 1-Sp. and 4-Sp.
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Blanchard M.D. Vert. Sp. Surface Grinder 26" chuck
L & S 20" x 8', 18" x 12', 20" x 10', 28" x 12'
B & S Nos. 2-B & 3-B, Cin No. 3 Mill, No. 2-B & 3-B, Cin. No. 5 Le-Bland, No. 4, Grd. Hd. Plain Millers
B & S Nos. 2-A & 3-A, Mill, No. 2-B, Cin. No. 1-M, Cin. No. 2 Grd. Hd. Univ. Millers
Campbell No. 213 abrasive cut off.
Brake D & K Lead type Power 10' Length ⅜" Capacity, L & N 8', 10' & 12' Press.
Bullard 24" & 36" Vert. Turret Lathes.
Lynd-Farquhar 26" stroke openside Shaper Planer.

MONA MEMBER

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LATEST TYPE

J&L No. TG1245 Thread Grinder
Monarch 33½"x120" cc G.H. Engine Lathe, Pan Bed (1947)
L & S 24"x192" cc G.H. Engine Lathe, Pan Bed
American 27"x96" cc G.H. Engine Lathe, Pan Bed
Gleason 12" Bevel Gear Finisher
Pratt & Whitney Keller Type "G"
Norton 6"x30" Cyl. Grinder, Hydr. Table & Head Traverse
H & W 10"x48" Thread Miller.

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BAR STRAIGHTENER
Timken bearings, motor driven, 1¼" capacity.
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1—Practically New HANNA 80-ton Portable & Stationary Pneu. Yoke Riveter, ser. 6456, reach 75", gap 24", complete with feet & bail suspension. New 1947. Very little use.

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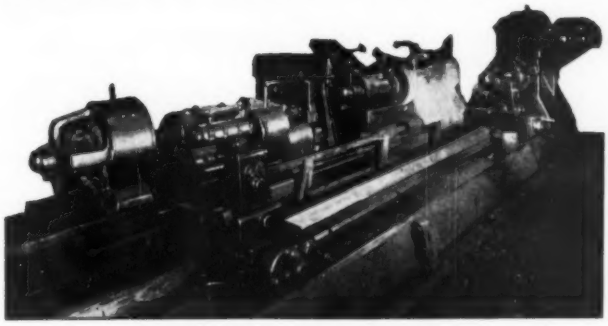

Norton Roll Grinder 50" x 28' (actual photo)

BORING MILLS
Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3⅜" cap
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS
Bausch Multi-spindle
Bausch Radial Tapper
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Walker-Turner Radial. 2½'
Natco #12 20 spindle

ENGRAVERS
Auto Engravers Bench Type
Deckel Type 3 GK2 Dimensional, New
Gorton #1A, ID, ME
Gorton #3B 3 Dimensional

GEAR EQUIPMENT
Barber-Colman #3, #2
Barber-Colman #12 Hobber (2)
Fellows High Speed Shapers 712, 72, 725, 71
Fiather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleaosn #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS
Bryant #5 Internal, chucking
Coval #91A Univ. Tool & Cutter
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl.
Norton 16"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G
Pratt & Whitney Contour
Pratt & Whitney Radius #R6, K.O. Lee Tool
Van Norman #666 Crankshaft
Vernon Tool & Cutter
Wicaco Internal

GRINDERS, SURFACE
Abrasive 8x24", #33 Vert.
#10 Blanchard 14" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Pratt & whitney 12x36" Vert.
Reid 11x36 Motor In Base

LATHES
Bertram 28"x22' CC, Late.
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Putnam 36"x22'
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.
Archdale Plain, 14", Prod.
Brown & Sharpe #000, 21
Burke #4 Plain & Univ.
Cinn. 08 Plain
Cinn. 1-12 Mfg. 2-18
Kent Owens 1V
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill
Sundstrand 0, 00 Rigidmills
Van Norman #2 Universal

MILLS, VERTICAL
Brown & Sharpe #3 single pulley drive
Cincinnati #4, OS Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 SP

PRESSES
Bliss 304A 4" Str.
Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Ferracute EG54, 400 Ton Knuckle
Niagara Herning, 15 Ton
Niagara A13½, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton
Zeh & Hanneman 42 Ton OBI

TURRET LATHES
Acme 6W Fox 2 9/16" Cap.
Bardons & Oliver #2 Late, #3
Brown & Sharpe, #1, 2 Head, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #3B 4½" Cap.
Gisholt #4 bar feed, Late
Hardinge second operation.
Jones & Lamson 2½" Saddle Univ. Late
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A

MISCELLANEOUS
Automatic, Cleveland Model B 1 1/16"
Automatic B & S #00G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36", DoAll V-36
Band Saw: #8 Marvel
Filers—DoAll Band Filer
Filers—Grob Band Filer
Hacksaw: Peerless 6"x6"
Hacksaw: Racine 10x10" Hyd.
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Shapers: 24" Rockford, 24" Cinci., 28" Gould & Eberhardt. Many Others
Shears Power: George Ohl 10'x3-1/16", 10' x 16 gauge, 11'x16 gauge
Toppers: #1 Bakewell, #3C Haskins
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA Hi-Wave

HYDRAULIC EQUIPMENT
SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
50 Ton William & White Gap Press, 20" St. 54"x20" Bed—24" opening
600 Ton William & White Up-Moving Ram 42"x60" platen 12" str., 24" opening self-contained.

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

NEW IN STOCK
Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30 ton —Shaper 7" Amco, 8" Shaperite—Shaper Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attach. Halco H.S. Motors Grinders, Buffers, all sizes.

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"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

AUTOMATICS
⅞" Gridley Model G.
1¼" Cone 4 spindle
1½" Cone 4 spindle
No. 454 New Britain Chucking
14"x19" Fay
14"x18" Monarch Magnamatics

BORING MILLS
84" Gisholt
34" King single turret
3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

DRILLS
14" Leland Gifford 1, 2 & 4 spdl.
14", 4 spdl Buffalo sensitive
15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 spindle
24", No. 4B Edlund, power feed
24" Cincinnati
Nos. 310, 315 Baker
No. 217H Baker horizontal
Barnes horizontal radial
3' Carlton sensitive radial
6'-15" Dreses radial
16 spindle No. 13 Natco multiple
1 & 4 spdl. Avey No. 2, woodpecker feed
7 spdl. Moline horiz. hydr.
12 spdl. Defiance adjustable rail

GEAR CUTTERS
14", No. 5A Lees Bradner hobber
24", No. 3 Adams Farwell hobber
Nos. 8H, 12H, 16HS, 18H G. & E.
No. 130 Cleveland Rigidhobber
No. 5A Lees Bradner hobber
4" Gleason spiral bevel
Gleason testers & lappers
Illinois involute tester
Red Ring shavers, lappers & speeders
24", No. 3 Adams Farwell hobber

GRINDERS, CYLINDRICAL
10"x18" Norton, plain & semi-auto.
10"x18" Landis hydraulic
10"x24" & 16"x72" Landis mechanical
10"x18", 10"x30" & 10"x50" Norton mech.

GRINDERS, INTERNAL
No. 75A Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding, head
No. 72A3 Heald Sizematic
Nos. 16-28 16F28 & 24-36 Bryant
Grenby bench type

GRINDERS, SURFACE
Nos. 10 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
14"x48", No. 5 Abrasive

MILLERS
No. 2 Cincinnati, horiz. & vertical
12" Cincinnati Plain Mfg.
18" & 24" Cincinnati plain automatic
No. 4-36 Cincinnati Hydromatic
18", 24" Cincinnati duplex
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
20"x84" table Ingersoll vertical
Ingersoll Rise & Fall
6 spindle Moline profiler
24"x18"x14' Ingersol planer
48"x24"x22' Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary
No. CT 36 Less Bradner thread
Nos. 4 & 6 Lees Bradner Univ. thread
4½"x12" & 6"x14" P&W thread

SHAPERS & PLANERS
24" Queen City Shaper
27 Morton Draw Cut Shapers
16" Bement Miles slotter
36"x36"x10' Betts planer
48"x48"x14' Woodward planer

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CARLTON 4'13" Radial Drill—48 spindle speeds, 15 to 1500 RPM—motor-on-arm—power traverse—plain box table.

NILES-BEMENT-POND 6' "Right-Line" Radial Drill—30 spindle speeds, 22.5 to 570 RPM—motor-on-arm—#5 Morse taper.

PLAIN & UNIVERSAL GRINDERS
CINCINNATI 6"x30" Plain Hydraulic—oscillating spindle — automatic infeed — 4-Motor drive — 1944 machine.

LANDIS 6"x18" Type "C" Hydraulic—4-Motor drive—power rapid traverse—late type.

BROWN & SHARPE #2 Universal 14"x30" capacity—lots of equipment—M.D.—late type.

LATHES
NILES-BEMENT-POND 48"x30' ctrs.—geared head—2 carriages—taper attachment—power rapid traverse—late type in excellent condition.

BOYE & EMMES 20"x192" ctrs.—Dbl. back geared—taper attachment—M.D.

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FOSTER #2FU "Fastermatics" (two)—cap. 3"—swing 23¾"—large ass't tooling—very latest type—like new.

MILLERS
CINCINNATI #0-8 Plain Automatic—Rise & Fall spindle carrier—table working surface 6½"x18¼"—late type.

CINCINNATI #5 Plain High Power—table 83"x21"—power rapid traverse—#50 taper—M.D.

BROWN & SHARPE #2A Universal—speeds 21 to 496 RPM—#50 taper—dividing head—vertical attachment—motor-in-base.

INDUMA #2A Universal—range 24"x9"x17"—vertical head—universal dividing head—motor-in-base—brand new.

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3 SHERMAN ST., WORCESTER, MASS.

FINE LATE TYPE GUARANTEED TOOLS

No. 7A JONES & LAMSON Universal Saddle Type Turret Lathe, preselector head, hardened ways

No. 2 SIMMONS Micro-Speed Turret Lathe, bar feed, 3 jaw chuck, 4 jaw chuck, power feed to turret, tooling, coolant pump, AC motor

56"x18' CMC Heavy Duty Lathe, 24 speed geared head, power rapid traverse, 30HP AC motor

100" SELLERS Vertical Boring Mill, 2 swivel heads on rail, rapid traverse, 40HP motor drive, rebuilt, excellent

10'-16" CMC Heavy Duty Vertical Boring Mill, extension type, 2 swivel heads on cross rail, weight approx. 125,000#

100" BERTRAM (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse

24' BULLARD New Era Type Vertical Turret Lathe, side head, motor drive

No. 1 DOUGLAS Plain Horizontal Mill, table 8"x32", power feeds, motor in base, No. 40 taper, new 1942

No. 2D KEARNEY & TRECKER Rotary Head Die Miller, cherring attachment, right angle milling attachment, slotting attachment, rotary table, measuring rods, new 1943

No. 2V REED PRENTICE High Speed Vertical Mill & Router, new 1942

No. 36 VAN NORMAN Ram Type Mill, new 1942

No. 5-48 CINCINNATI Duplex Hydromatic Mill, new 1941

No. 10 BROWN & SHARPE Tool Grinder, 1943

No. 7125A FELLOWS High Speed Gear Shaper, change gears 1943

No. 5 JOHNSON O.B.I. Press, new 1944, 55 tons

No. 6 TOLEDO O.B.I. Press, 70 tons

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

V-6-24 COLONIAL Vertical Broach, 6 ton, 24" stroke, 1947

V-6-36 COLONIAL Vertical Broach, 6 ton, 36" stroke

36"x36"x10' GRAY Planer, DC reversing drive, box table, rapid traverse

No. 5 HILLES & JONES Pyramid Type Plate Bending Rolls, 14" diameter top roll, 12" diameter bottom roll, 10' long, drop end housing, 30 HP slip ring motors

No 60 NEW BRITAIN 1"—6 Spindle Automatic Screw Machine, new 1943

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100 KW Tocco Induction Heating Unit Three Station

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Landis 1" Bolt Threader, 3 SCD.
Acme "Class A" Single Head Bolt Cutter, 3 SCD.

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Aurora 20" Stationary Head, 4 SCD.
Aurora 24" Sliding Head, motor drive arrangement.

TURRET LATHES

South Bend 16"x6', complete, late type

MILLERS—Auto. or Prod.

Cincinnati 28" Semi-Automatic Duplex
Hall Style "D" Planetary, late type

GEAR MACHINERY

Flather 30" Automatic Gear Cutter
Gleason 3" Straight Bevel Gear Generator

BORING MILLS

King 52" Vertical Mill, 2 swivel heads

MILLERS—HAND

U.S. Hand Miller, #9 B&S taper hole
Bristol #2 Hand Miller, motor driven

PIPE CUTTERS

Landis 2" Pipe Threading & Cutting Machine
Wyland 4" Pipe Machine, belt drive
Curtis 4" Pipe Threading Machine

PLANERS

Niles 48"x48"x10' Timesaver Planer 25 HP DC motor and controls; two rail heads, 1 side head, forced feed lubrication

PUNCH PRESSES

Verdin-Kappes & Verdin, 2" stroke
Consolidated Punch Press, 1" stroke
Robinson A-3, 2" stroke, 32 ton
Bliss Coining Press, 3/4" stroke

ROLLS

Niles Bement Pond Bending Roll, initial type, 3/8" capacity, motor driven

WHEEL PRESSES

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LeBlond 21"x10' bed, 3 SCD.
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Lodge & Shipley 18"x6' bed, 12 spindle speeds.
Monarch 16"x8' bed, 3 SCD.
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Lodge & Shipley 10"x8' bed, 12 spindle speeds.
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Norton 10x24 plain.

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10" Hole Steinle Turret Lathe
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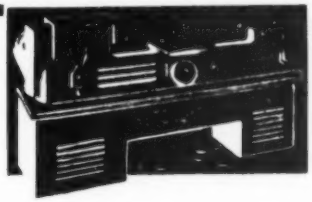

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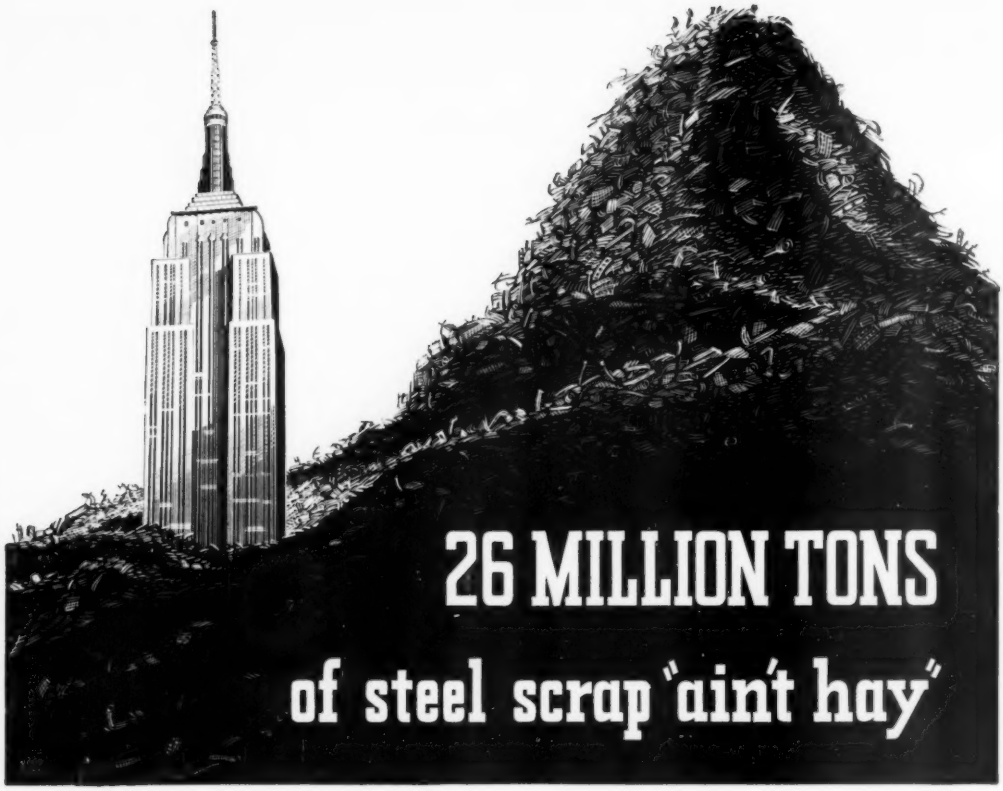

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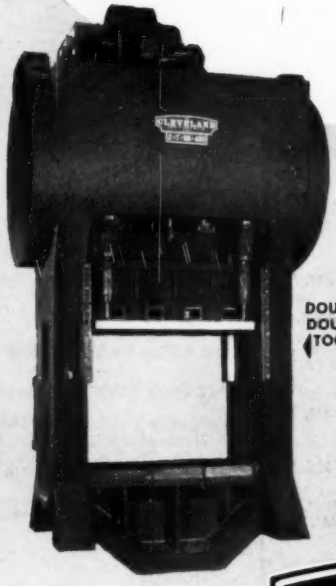

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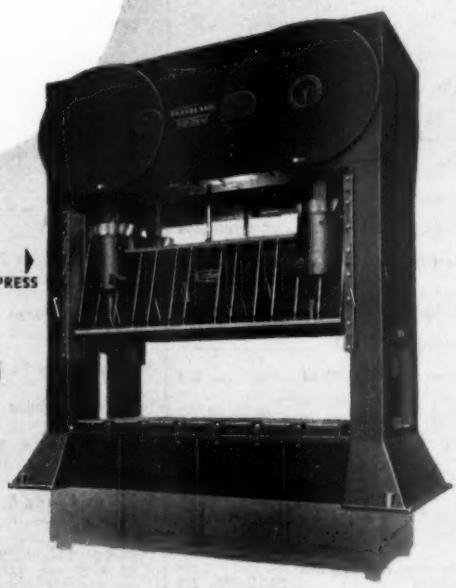

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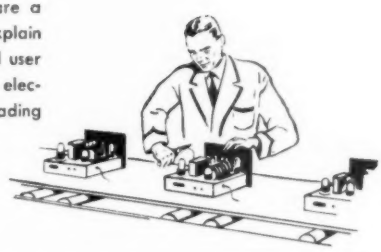
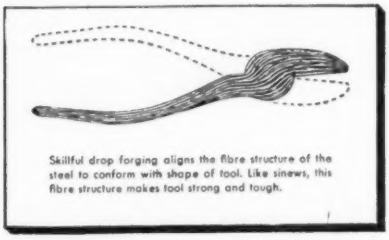
WHAT EVERY TOOL USER SHOULD KNOW

Users of UTICA tools have long recognized their exceptional drop forged strength and ability to take hard usage. Not all have known, however, just *how* these qualities of ruggedness and long performance are built into UTICA tools.

The simple diagrams below are a short, graphic answer. They explain quickly why the professional tool user insists on a drop forged tool with electronic induction hardening. The reading time is less than 2 minutes.

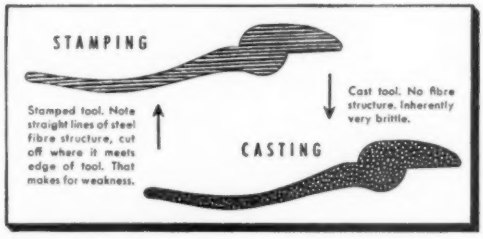


DROP FORGING MEANS STRENGTH



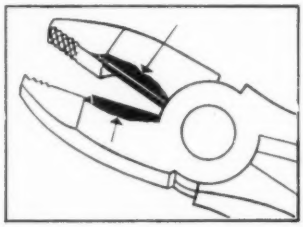
Skillful drop forging aligns the fibre structure of the steel to conform with shape of tool. Like sinews, this fibre structure makes tool strong and tough.

CONTRAST THIS WITH

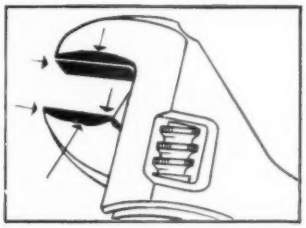

STAMPING
Stamped tool. Note straight lines of steel fibre structure, cut off where it meets edge of tool. That makes for weakness.
Cast tool. No fibre structure. Inherently very brittle.
CASTING

ELECTRONIC INDUCTION HARDENING MEANS RESISTANCE TO WEAR

Pliers made of good steel can be brought to almost any desired degree of hardness. But *hardness* is by no means *toughness*. Throughout most of its structure the pliers must be *tough*. Only at the cutting edge should it be *hard*.



The miracle of Utica's electronic induction hardening is that it can harden just the exact area where hardness is required. Note here—only the cutting edges are hardened (for lasting sharpness). The rest of the tool retains the *toughness* required for resistance to breakage.

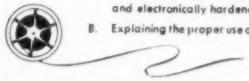


Here are the jaws of a Utica adjustable wrench. Note the pattern of electronic induction hardening, limited just to the working *surfaces* of the jaws where maximum wear occurs. This resists burring—yet the internal structure of the jaws, as well as the handle, retain their drop forged toughness.

FREE: FOR EMPLOYEE TRAINING PROGRAMS

Two Wall Charts
32 x 12 INCHES

A. On the advantages of drop forged and electronically hardened tools.
B. Explaining the proper use of pliers.



TWO Sound MOVIES
10 MINUTES EACH
(user pays return shipping cost only)

"ADD POWER TO YOUR HANDS"
"PLIERS: *Their Use and Care*"

"First Aid For Pliers"
8 PAGE BOOKLET
Illustrated instructions on care and repair of pliers.

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DROP FORGE AND TOOL CORPORATION
UTICA 4 NEW YORK

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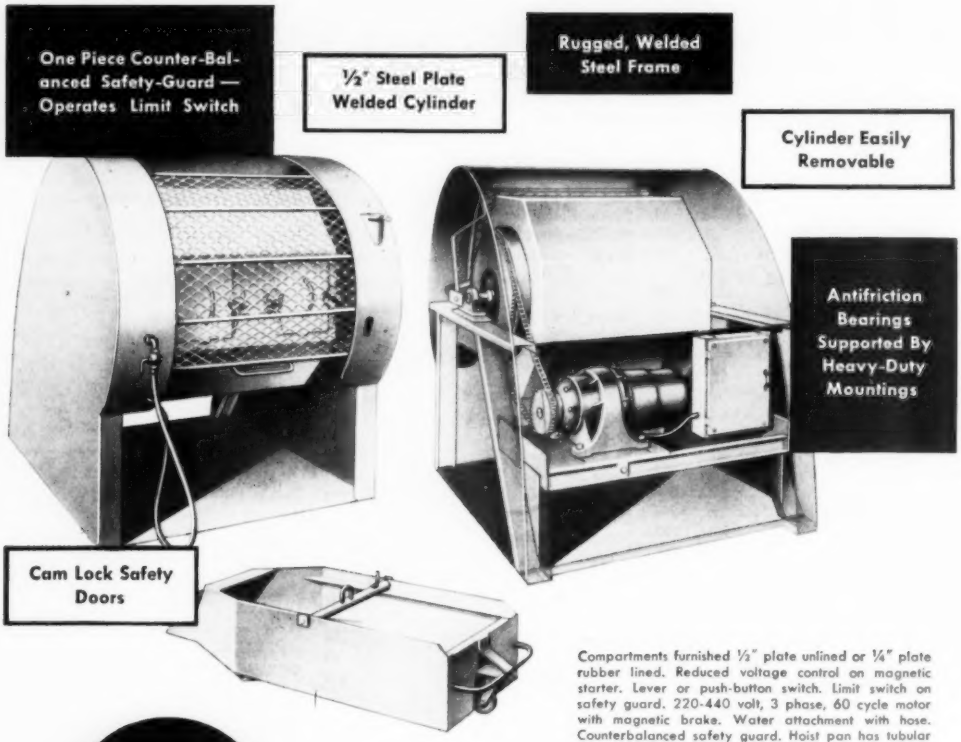
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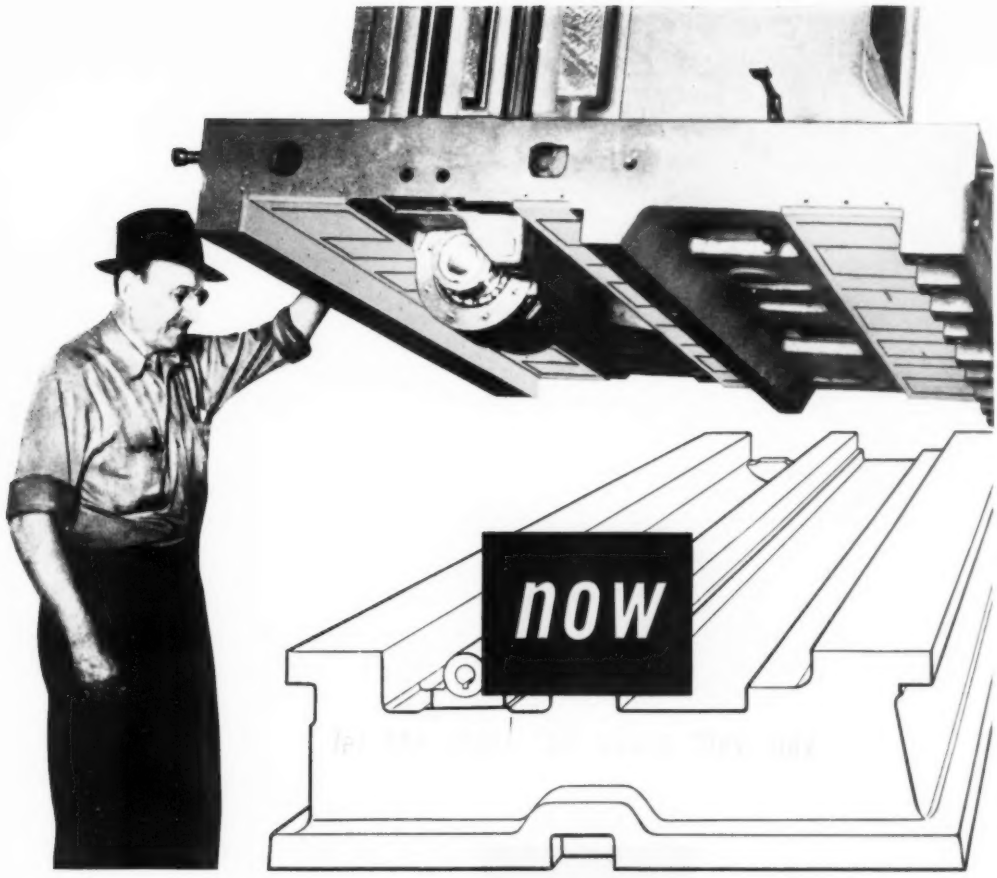
THE GRAV-I-FLO CORPORATION

Dept. AM10, 400 Norwood Ave., Sturgis, Michigan



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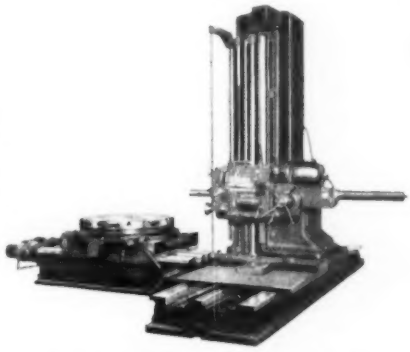

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